AMERICAN MACHINIST

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Multiple-Spindle Automatic Drill Press.

These machines are made with any number of spindles required; each spindle being entirely independent of the others, may be stopped to change or sharpen the drill without stopping the machine or in any way interfering with the other spindles.

The feed is automatic, and can be set to feed any depth of hole, and when through its work the feed is released and the drill returns to place, ready for the operator to change the work and start it again.

The machine drills holes to $\frac{3}{8}$-inch diameter, and is designed for the use of manufacturers of all kinds of hardware and metal goods.

The manufacturers are the Hendey Machine Co., Torrington, Conn.

Edge Moulding or Shaping Machine.

The illustration represents a machine brought out by Baxter D. Whitney, Winchendon, Mass.

The frame of this machine is a casting in one piece, giving a solid support for the table and working parts.

The spindles are tool steel, with conical journals; those nearest the cutter are $2\frac{1}{4}$ inches diameter, the others being $1\frac{3}{4}$ inch These journals run in self-oiling composition boxes, with means for adjustment.

The frames that support the spindle boxes are heavy, and slide in gibbed seats in the base, and have a vertical adjustment of three inches, governed by inclined planes, which are operated by hand wheels at the side of machine.

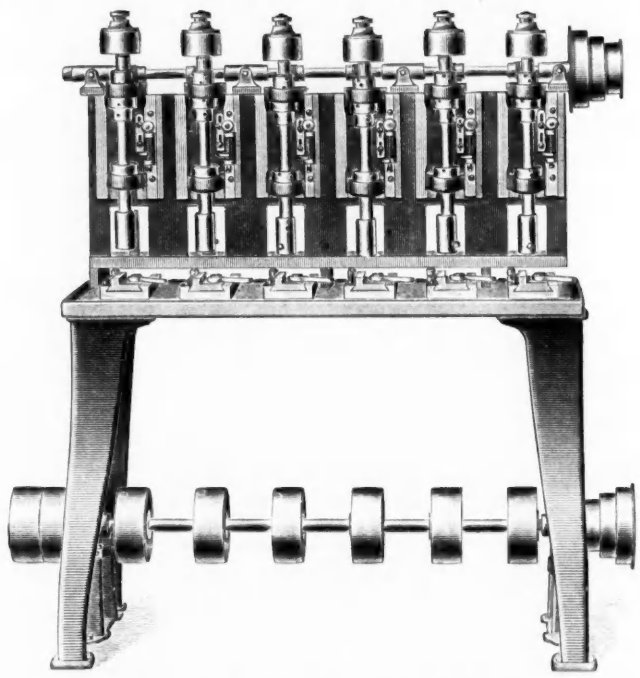
The arrangement of the counter-shafts cause the belts to approach and leave the spindle pulleys nearly at right angles to their axis, thereby allowing the counter-shafts to be placed near the machine, without causing the great strain and wear upon the belts which there is when arranged in the ordinary manner.

The driving pulleys on counter-shaft are eight inches diameter and may make 1,200 revolutions per minute, which makes the spindles revolve five thousand five hundred. Weight of machine 2,200 lbs.

Opportunities Young Mechanics Should Not Lose.

Young mechanics and others residing in Brooklyn, N. Y., who seek for knowledge which will enable them to rise in their profession, should avail themselves of the great advantages and privileges offered by the Young Men's Christian Association, located in that city. This association occupies a building admirably adapted for educational purposes, lectures and entertainments. In this capacious, well lighted, warm and exceedingly comfortable and cheerful building will be found educational classes in French, German, elocution, vocal music, mechanical and architectural drawing, book-keeping, penmanship, phonography and type-writing—all under the charge of very able professors. Beside these, there is a circulating library containing 7,000 volumes, a reading room with 250 papers and magazines. Members of this association have also the privileges of attending receptions, practical talks, parlor games, social and religious gatherings. For health and physical education the gymnasium, bowling alleys, swimming bath, running track and rowing machines are well adapted.

We wish to call the attention of the young mechanic to the classes of mechanical and architectural drawing, which are in the charge of an able and courteous teacher, Mr.

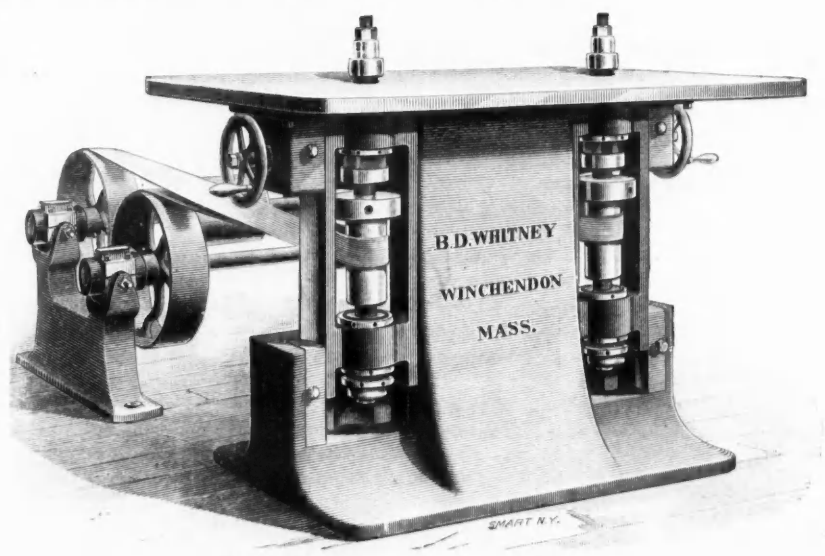


MULTIPLE-SPINDLE AUTOMATIC DRILL PRESS.

L. Duvinage. The members of the class in architectural drawing meet every Wednesday, and the members of the mechanical drawing class meet every Monday and Friday. About thirty-six members belong to each class, which are about as many as the room will accommodate, and certainly as many as, if not more than, one teacher can attend to. The class room is appropriately furnished, well lighted and heated—indeed it is a very cheerful room in which an hour and a half can be very profitably spent. When, a few weeks ago a representative of the AMERICAN MACHINIST visited the rooms of this association, he found nearly all the members of the drawing class present, industriously working out geometrical problems and general machine design; and if these bright and intelligent young men will continue these studies, they will in time reap the benefit which they deserve. Mr. Duvinage takes great interest in the advancement of his scholars, and endeavors to make the lessons as plain and interesting as possible.

Those who wish to avail themselves of these opportunities of improvement and enjoyment must become members of this association. Two thousand men are now enrolled, yet the building can accommodate 5,000 members.

Any young man, without regard to religious belief, may be admitted to membership on giving satisfactory references as to moral character. The expense of membership being so small should not debar any one from becoming a member.



EDGE MOULDING OR SHAPING MACHINE.

For two dollars per year a person will have access to the library and reading room; and also obtain admission to receptions, practical talks, parlor games and social gatherings.

For five dollars per year a person is entitled to the foregoing privileges, and besides these can join the classes in French, German, elocution, vocal music, mechanical and architectural drawing, book-keeping, penmanship, phonography, and type-writing.

For fifteen dollars per year—which is the price of a full ticket—a person can avail himself of all the advantages and privileges offered by this association, including, besides those mentioned, the use of the gymnasium, bowling alleys, swimming bath, running track, and rowing machines.

Associations of this kind, and institutions like Cooper Institute, of New York, are doing a great amount of good, and should be appreciated by all young men, and encouraged by the older ones.

The valuable building, occupied for the steel plant of the Ohio Iron Works, in Zanesville, O., was burned in a peculiar manner. It was built on ground made of cinders and refuse from the blast furnace. The cinder underneath was set on fire by the furnace and smouldered for a long time, finally bursting into flame, though efforts were made to check the subterranean fire. It is feared that other buildings belonging to the works are in danger, as they are built on the same kind of foundation.

Suggestions in Machine Design.

VI.

BY A. J. SHAW.

In order to secure the best results, it is not sufficient that the quantity of oil supplied to a bearing in a day, or in an hour, be sufficient for that period; but the supply should be regular, and as nearly continuous as possible.

For fast running journals these conditions are not only desirable, but are essential to safety, as even a momentary failure of the oil supply may cause their destruction.

A small quantity of oil, fed at frequent intervals, or a minute but constant flow, is preferable to a larger quantity supplied at widely separated or irregular intervals.

Where it is possible to flood bearings and return the oil to be used again, a higher degree of efficiency and economy can be attained than by any system of limited feed. One reason for this is that the excess of supply, and the consequent circulation, insures that the lubricant shall be supplied to not only a few, but all portions of the bearing.

It may not be well, however, to use the oil too long, or too many times, before renewal.

Oil seems to wear out by long continued use, and to lose, to some extent, its lubricating qualities. It has been suggested as a reason for this that the minute spherical globules of which the oil is conceived to be made up, become flattened by the wear and pressure, and so do not slide and roll over each other as easily as before.

When possible so to arrange, oil holes and feeding arrangements should deliver the lubricant to the unloaded side of the bearing. It has been demonstrated that oil holes opening on the loaded segment of a journal, not only may refuse to deliver oil into the bearing, but may even serve as vents through which is pumped out that fed to the bearing by other means.

It is not sufficient to drill an oil hole into the bearing. Oil grooves and channels should be cut to serve as distributors, and on closely fitted bearings they should be vented.

Don't countersink oil holes, unless they are to be covered by oil stops; they will catch dirt enough without making funnels of them.

An inexpensive and effective method of making the oil supply and distribution regular and continuous, on bearings of small or moderate size, in situations in which oil cups are undesirable or inadmissible, is afforded by a strip of felt, inserted in a deep slot cut in the side of the box, and in contact with the surface of the shaft or bearing. The lubricant is supplied to the felt, which, becoming saturated, serves both as an oil reservoir and distributor.

This arrangement, in one of its simpler applications, is shown in Fig. 1, which requires no explanation.

When the felt is once well saturated with oil, the supply will be sufficient for a surprisingly long time.

A very effective arrangement for oiling pulleys or gears running loose on fixed shafts or studs, is shown in Figs. 2 and 3, which is simply an inversion of the device shown in Fig. 1, the felt being inserted in a groove cut in the stud or pin, instead of in the box

Of the two arrangements given, the one shown in Fig. 2 is for a pin supported at each side of the pulley, the oil being supplied through either or both of the end supports; while that shown in Fig. 3 is for an overhanging stud to which the oil is supplied at the outer end, the groove being cut into and through the upper side of the collar to form an oil channel.

The felt should be cut somewhat larger than is barely necessary to fill the groove, and should be crowded in, in order that its elasticity may keep it in contact with the bearing surface.

For journals with inserted bushings, below which may be arranged an oil well and return channels, a neat and inexpensive application of the overflow principle is shown in Fig. 4

The bushings are shorter than the outer box, in which, at each end, is cut or cored an annular groove connected with the central oil well by longitudinal passages below the bushing.

The oil is supplied to the bearing by wicking as shown, which should be drawn loosely through the holes in the bottom of the bushing, and which should be of sufficient thickness to press lightly against the shaft.

Owing to its low lip and large diameter the wick will deliver an excess of oil, which, flowing to the ends of the bearing, is caught by the annular grooves and returned to the oil well to be used again and again.

Put loose pulley hubs in center of pulleys and make them long—the longer the better.

If loose pulley hubs are unsymmetrical, the holes are apt to wear conical, refuse to retain the lubricant, and give trouble.

There is but one effective method of oiling high speed loose pulleys—from the center of the shaft.

The first of these things is essential, the others are desirable; that there should be a supply of oil whenever there is relative movement of the pulley and shaft, that the supply should cease when the shaft and pulley are moving together, and that the rate of feed should be at least approximately proportional to the relative speed of the bearing surfaces.

To meet these requirements in a case in which the usual methods of oiling had proven unsatisfactory, the writer some two or three years since devised the arrangement shown in Figs. 5 and 6, which, as far as he is aware, is a new one. It is not and will not be patented. It has been adapted to and used on several machines, and has, in each instance, given excellent satisfaction.

In Fig. 5, it is shown as applied to a shaft carrying "overhung" tight and loose pulleys, and in Fig. 6 as adapted to the arrangement of one tight and two loose pulleys in common use for reversing the direction of motion with open and crossed belts, the shaft having bearings outside the loose pulleys.

The principle of the device is that of the stylographic pen and of the well-known needle oiler. The flow is gauged and regulated by pins loosely fitting the supply holes, the space between the pins and the sides of the holes being so small as to allow no flow of oil when the parts are at rest, but permitting it to pass when the pins are by any means put in vibration.

The sliding of the pin over the surface touched by its end sets up such a slight vibratory movement, the rapidity of the vibrations and of the consequent flow of oil being to some extent dependent on the velocity of rubbing.

It is probable that the feed would take place even if there were no movement of the pins, on account of the natural tendency of the lubricating fluid to flow into the place of that carried away by the bearing, but the small annular space between the pin and the side of the hole might soon become so clogged with minute particles of dirt or gum that the flow would be checked even if it did not cease entirely. The passage is kept clear, however, by the vibration of the pin which facilitates the passage of these impurities as well as of the lubricant itself.

The difference in the diameters of the hole and the pin is dependent on the rate of feed desired, and must be determined by experiment, but for ordinary cases may be from two to four-thousandths.

The arrangement with through pins, shown in Fig. 5, and on the left of Fig. 6, is suitable for small shafts, while the shorter pins, shown at the right of Fig. 6, are more suitable for shafts of medium or large diameters.

If through pins are used, their lengths should be a little less than the diamater of the shaft, while for short pins the length should be such that they may not quite touch the back of the central hole when in contact with the bore of the pulley.

There should be at least two through or three short pins, in order that, with but a small supply of oil in the central hole, which acts as the oil reservoir, one, at least, of the feeding holes may be below its surface.

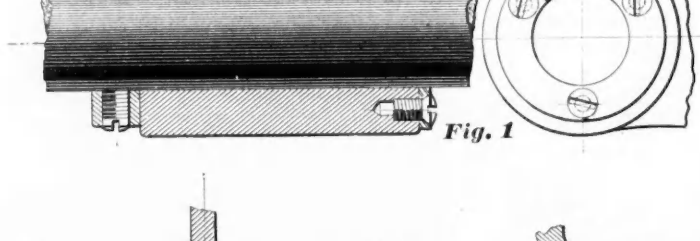


Fig. 1

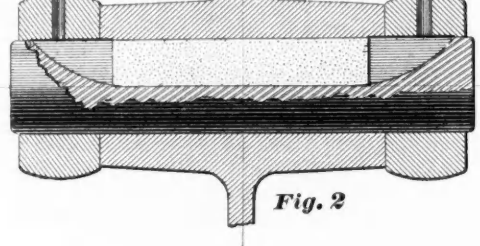


Fig. 2

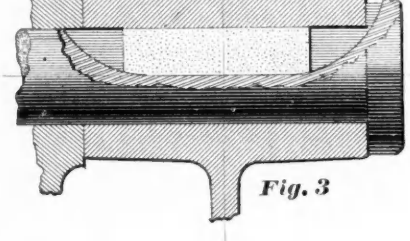


Fig. 3

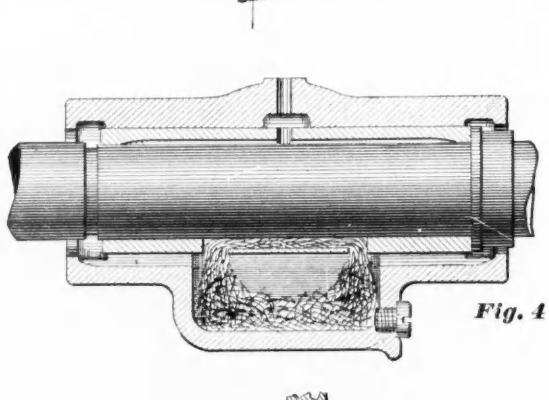


Fig. 4

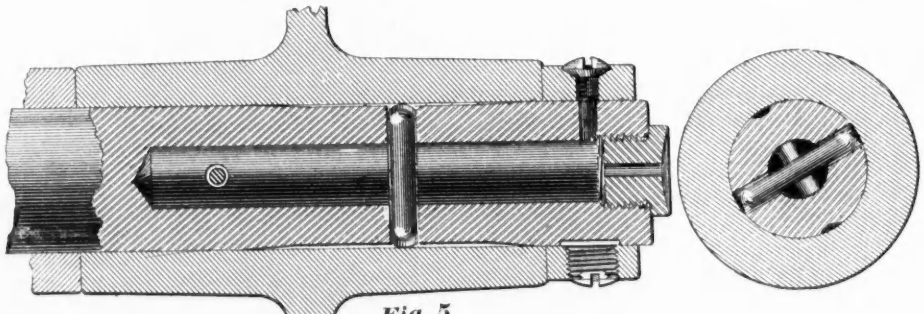


Fig. 5

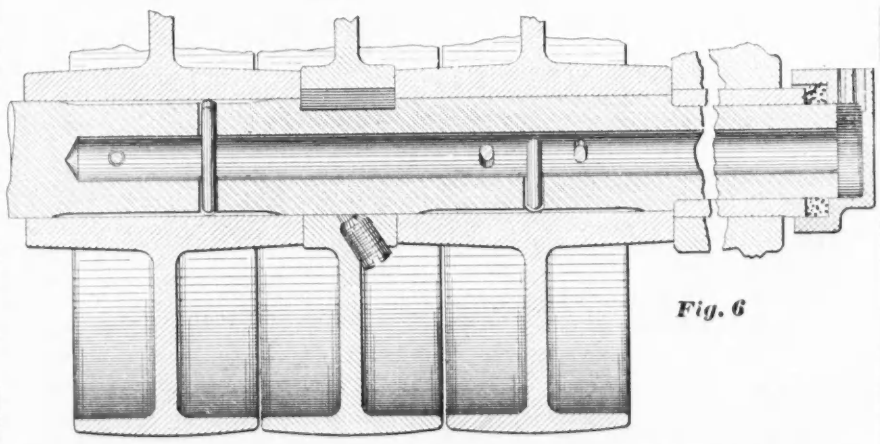


Fig. 6

A similar general arrangement with felt or leather plugs substituted for the pins, has been used successfully, but the writer believes the needle feed to be the most reliable, as it is less likely to fail from "gumming up" than any feeding device which filters the lubricant through fibrous or porous material.

With the needle oiler the rate of feed is approximately proportional to the speed of the rubbing surfaces an obvious advantage in cases in which that is variable.

No automatic feeding arrangement can be depended upon to feed low grades of gummy, sticky oil for any length of time.

If you know that this kind of oil (?) is to be used, arrange the machines to be oiled in the "good, old way."

Modern Locomotive Construction.

By J. G. A. Meyer.

Thirty-Third Paper.

With a correct designed shifting link motion, we will obtain an equal lead when the link is in full gear, and very nearly an equal lead when the link is in half gear; we will also obtain an equal cut-off when the link is in half gear, and as little slip of the link on the block as possible. The slip is greater when the link is in full gear than when the link is in mid-gear, and generally the slip in forward gear will exceed the slip in the backward gear. But since there will be always more or less slip, and since this will cause wear and create "lost motion," the link must be made of such metal which will enable it to run as long a time as possible without wearing to any appreciable extent, and thus preserve the delicate action of the link.

We therefore find the majority of the locomotive links made of wrought iron, case-hardened, which gives a smooth and excellent surface to resist wear.

During late years cast-iron links and links cast of steel have been adopted and used. These will wear faster than wrought iron links case-hardened. But the lost motion caused by wear is not admissible, therefore cast-iron or cast steel is mostly used for the skeleton links, as shown in Figs. 185 and 186. In these links very thin copper strips are inserted at *g g g g*, so that when the lost motion will affect the correct action of the link to an extent which is hurtful to the engine, a strip or liner is taken out, and the delicate action of the link restored. Again, if the wear of these links becomes excessive, they can be easily replaced by new links, as the cost of these is comparatively small. Figs. 185 and 186 represent the form of a skeleton link made of cast-iron, and used on a number of mogul engines having cylinders eighteen inches in diameter. The same form is also adopted when the link is to be cast of steel. We have met with a few locomotives having cast-iron links of a form similar to that of a solid wrought-iron link, such as shown in Fig. 182.

But skeleton links are not always made of cast-iron or cast of steel; often we find skeleton links made of wrought-iron case-hardened, as shown in Fig. 175 (February 12th), and these are preferred on many railroads.

In such links a difficulty is experienced in putting back the end bolts after some of the liners have been taken out, because then these bolt holes—which incline toward each other—will not be in line; therefore, in order to avoid this difficulty, some master mechanics make the form of the links as shown in Fig. 184, in which bolts *h h* are parallel to each other.

The eccentric rod-pins will, in a comparatively short time, wear the holes oblong; and, therefore, in order to preserve the link as long as possible the holes *e* and *f*, Fig. 182, are bushed; the bushing is made of wrought-iron about $\frac{3}{16}$ or $\frac{1}{8}$ of an inch thick, case-hardened, and then forced into the link, usually with a hydraulic pressure of four tons. This bushing is used in wrought iron, and also in cast links. When the wear of the pin and bushing becomes so great as to affect the action of the link, the pin and bushing can be easily and cheaply replaced by new ones. Sometimes we find links in which the bushing has been fitted in loose; in these cases the bushing is slightly longer than the width of the link, and held fast in the eccentric rod jaw by tightening the nut of the eccentric rod-

pin, and thus allowing the bushing to move freely in the link. Loose bushing is better adapted for cast links than for wrought-iron case-hardened links, because the former can be more readily and in less time rebored, or replaced by a new link if necessary and with less expense than the latter.

The eccentric rod-pins are also case-hardened. The cross sectional area of one of these pins should not be less than half the area of the rocker pins given in the thirty-second paper; locomotive builders generally make the area of an eccentric rod-pin a little larger than half the area of rocker-pin, so as to obtain a larger bearing surface. The diameter of the eccentric rod-pins for engines having cylinders 19 or 20 inches in diameter is usually $1\frac{1}{4}$ inches; for engines having cylinders 16, 17 or 18 inches in diameter, $1\frac{1}{8}$; and for smaller engines, 1 inch.

For locomotives having cylinders 10 inches in diameter and upwards, the distance between the centers of the eccentric rod-pins *e* and *f*, Fig. 182, generally varies from 9 to 10 inches; and for locomotives having cylinders 16 inches in diameter and upwards, the distance between these eccentric rod-pin centers generally varies from 11 to 12 inches; sometimes, but rarely, this distance is 13 inches. The distances between the eccentric rod-pin centers should not be made less than those here given, because, if we do so, the slip of the link on the block will be increased. Neither can these distances be made much longer, because generally the room under the locomotive will not admit longer links.

In locomotives having cylinders 10 inches in diameter and upwards the throw of the eccentric is from $3\frac{1}{2}$ to 4 inches; and locomotives having cylinder 16 inches in diameter and upwards, the throw of the eccentric is from $4\frac{1}{2}$ to $5\frac{1}{2}$ inches, oftener 5 inches. Now comparing the throw of the eccentrics with the distances between the eccentric rod-pin centers, we find that this distance varies from $2\frac{1}{4}$ to $2\frac{1}{2}$ times the throw of the eccentric. Hence, in designing a locomotive link we may make the distance between the eccentric rod-pin centers equal to $2\frac{1}{4}$ or $2\frac{1}{2}$ times the throw of the eccentric. Although this is an empirical rule, it is a safe rule to adopt.

The distance between the eccentric rod-pin arc and the link arc must not be greater than necessary; it should be such as will allow one-sixteenth of an inch clearance between the flanges of the link block and the ends of the eccentric rods. By increasing this distance we will also increase the slip, which must be avoided. In ordinary locomotive practice this distance varies from $2\frac{1}{4}$ to 3 inches, and occasionally reaches $3\frac{1}{8}$ inches.

The length of the link, that is, the distance from *c* to *d*, Fig. 182, should be sufficiently great to allow the center of the link block to be placed in line with the center of either one of the eccentric rod-pins; and when running in this gear the link block will be prevented from coming in contact with the end of the link opening. In fact, $\frac{1}{4}$ of an inch clearance between the link block and end of link opening is preferable.

Consequently, to determine the length of a link, we must know the distance between eccentric rod-pins, the length of the link block, the maximum slip and the desired amount of clearances. The sum of these items will be the length of the link.

Ex. 36. The distance between the eccentric rod-pins is 12 inches; the length of the link block is 6 inches; the maximum slip is $1\frac{1}{8}$ inches, and the desired clearance at either end must not be less than $\frac{1}{4}$ of an inch.

$12'' + 6'' + 1\frac{1}{8}'' + \frac{1}{4}'' + \frac{1}{4}'' = 19\frac{5}{8}'' =$ length of link.

The length of links in the different locomotives having cylinders 16 inches in diameter and upwards, varies from 18 inches to $19\frac{7}{8}$ inches, rarely exceeding the latter dimension.

The radius of links in nearly all locomotives is equal to the distance between the center of the main driving axle and the center of link block pin (sometimes called the lower rocker arm pin), when the latter stands in the center of its travel.

It has been found that, with this radius, the variation of the lead is sensibly equal for the front and back strokes of the piston. Sometimes, when greater accuracy in the equalization of the lead is required this radius of the link is made a little shorter.

In order to obtain the breadth *B*, Fig. 183, and the thickness *T*, Fig. 182, of a wrought-iron link, we should know the pressure of the valve against its seat, but since the existing data is not sufficient to determine this pressure accurately, we will assume that the friction of the valve on its seat—and which the link has to overcome in moving the valve—is proportional to the total steam pressure on the back of the valve.*

Consequently, for the purpose of obtaining these dimensions of the link, we will adopt the same rule as that used for finding the principal dimensions of an eccentric, given in the twenty-sixth paper.

Therefore, for finding the breadth *B* and thickness *T* of a wrought-iron link we use the same units found by this rule and multiply the unit by the numbers given in table 12.

Table 12.

Breadth *B* of wrought-iron link = unit × 1.62
Thickness *T* " " " = unit × .81

Example 37. Find the breadth *B* and the thickness *T* of a wrought-iron link suitable for a consolidation engine having cylinders 20 inches in diameter; the length of valve is 10 inches; breadth of the same 20 inches; and pressure of the steam in the steam chest 120 pounds per square inch.

We find in the twenty-sixth paper that the unit for this size of slide valve is 1.54, hence:

$1.54 \times 1.62 = 2.49'' +$ = breadth of link.
$1.54 \times .81 = 1.24'' +$ = thickness *T*

Example 38.—Find the breadth *B* and the thickness *T* of a wrought-iron link suitable for an eight-wheeled passenger locomotive having cylinders 10 inches in diameter; slide valve being 6 inches long and $11\frac{1}{2}$ inches wide; steam pressure in steam chest 120 pounds per square inch.

We find in the twenty-sixth paper that the unit for this size of slide valve is .91, hence:

$.91 \times 1.62 = 1.47'' +$ = breadth of link.
$.91 \times .81 = .73'' +$ = thickness *T*.

Now, comparing the dimensions obtained in Example 37 with the dimensions of the link in Figs. 182 and 183, which is a drawing of a link used in a consolidation engine with cylinder 20 inches in diameter, lately built and now in active service, we find that these dimensions agree very closely. It will also be found that the dimensions of other wrought-iron links, obtained by this rule, suitable for locomotives having cylinders 13 inches in diameter, and others having cylinders of larger diameter, up to 20 inches, will agree very closely with the dimensions of the links in locomotives of the foregoing sizes and at present in active service.

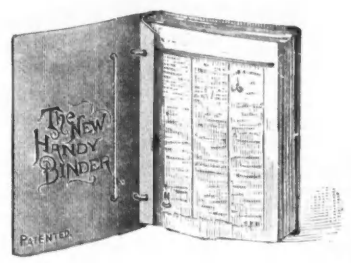
But when links made for smaller locomotives, and whose dimensions have been obtained by the foregoing rule, are compared with the links made according to the present practice of locomotive builders, it will be found that the former are lighter than the latter.

Take, for instance, Example 38. In this we find that the breadth of the link suitable for locomotives having cylinders 10 inches in diameter is 1.47 inches, say $1\frac{1}{2}$ inches, whereas the breadth of links in locomotives of this size, and at present in active service, is $1\frac{3}{4}$ and sometimes 2 inches. But when it is necessary to build a very light locomotive, the writer believes that links proportioned by this rule will give good satisfaction, although they will wear somewhat faster than those having a greater width.

The tendency in modern locomotive construction is to make the saddle-pin longer than formerly. This, in the writer's opinion, is a great improvement. The length of saddle-pin for locomotives having cylinders 17 up to 20 inches in diameter, is generally 6 inches long, as shown in Fig. 183. For smaller locomotives the length of saddle-pin is decreased; a saddle-pin, 4 inches long will work very satisfactorily in locomotives with cylinders 10 inches in diameter. These saddle pins should not be made shorter, unless compelled to do so by the narrow gauge of the road.

The diameter of the saddle-pin is usually about one-eighth of an inch less than the diameter of the link block pin.

Figs. 187 and 188 represent a link hanger suitable for a link, shown in Fig. 182. The dimensions given represent the size of link hanger suitable for locomotives having cylinders 19 inches and others having cylinders 20 inches in diameter. Usually the holes are bushed with wrought-iron ferrules case-hardened.



New Binder for the American Machinist.

The cut shown herewith represents a new style of binder for the files of the AMERICAN MACHINIST. It is flexible and can be rolled up and sent by mail very conveniently. It has an adjustable flexible back and the shape of a complete volume is maintained as each paper is added to the file. It does not mutilate the papers. This binder does not take the place of our regular "Common Sense" binder with stiff cloth-covered sides. The new binder will be sent by mail anywhere in the United States at 50 cents each, postage prepaid. It will be sold and delivered in our office at 40 cents each. The "Common Sense" binder will be sent by mail as heretofore for $1.00 postage prepaid, or sold in our office at 75 cents.

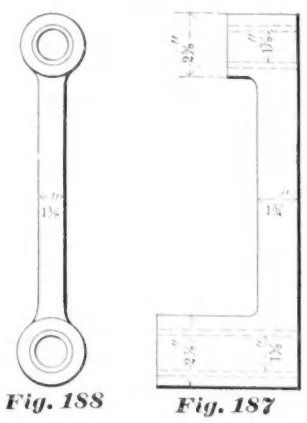


Fig. 188

Fig. 187

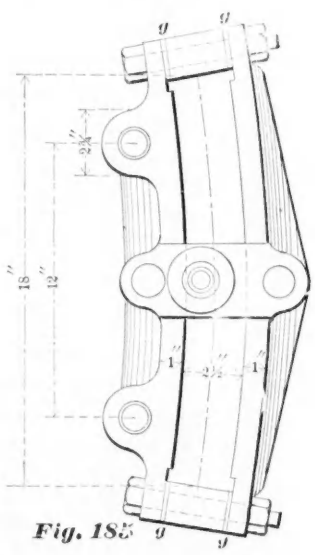


Fig. 185

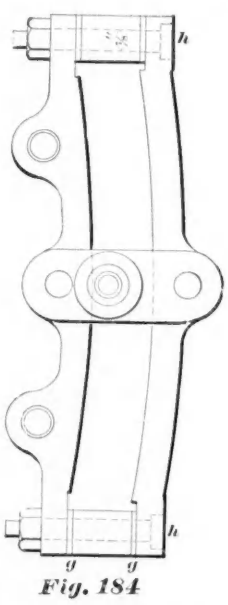


Fig. 184

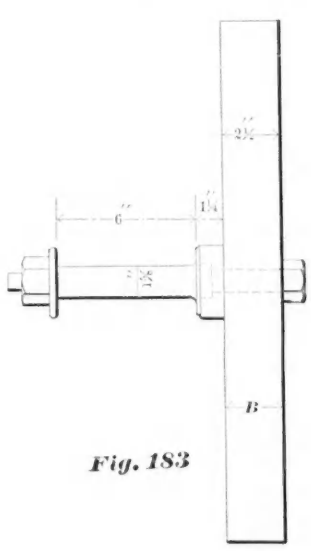


Fig. 183

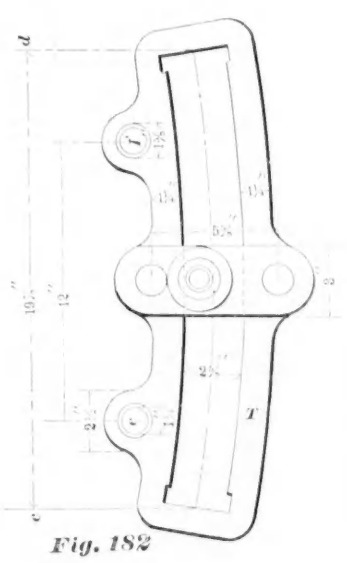


Fig. 182

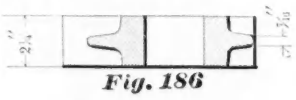


Fig. 186

LOCOMOTIVE CONSTRUCTION.

Casting Ornamental Iron Work.

William Newton writes us as follows:

In your issue of January 29th, J. H. Holmgreen asks for a better plan for fastening castheads and ornaments to wrought-iron than the one he now uses. The following is the way we used for "cemetery" and lawn railing: For lengths of rods not over two or three feet long, make the core prints as long as the wrought-iron is needed; also same shape and size in section, and use flasks long enough to receive them. But if longer ones were needed, such as are used for pale gates, etc., the core prints will be just long enough to extend through the end of flask and allow sufficient room between end and casting to retain enough sand to make a proper mould.

In preparing the wrought rods for the moulds ascertain the length required to be enclosed in casting, make red-hot, and give that part a few blows with the pene of a hammer (four will be ample); when cold they will be ready for the mould. Should there be any rust on them it must be removed, or you will be liable to have trouble with the castings. A nail keg, half filled with dry, sharp sand, is a good thing for the purpose; by giving the rods a few thrusts in this, they will be clean enough. I have never had any trouble with the above. Of course, the rods that extend outside the flasks must be supported in some way; also spaces must be cut in the edges of cope and drag.

WILLIAM NEWTON.

Our English exchanges report some improvement in manufacturing there, and outline prospects for the future as good.

The Engineer publishes a letter from an English engineer residing in the United States. He calls the present state of business here a boom. He thinks there will be "some very decided movement against the fast growing monopolies that now really control everything in this country."

Engineers in England appear to be about evenly divided in their opinions of the final success of compound locomotives.

* It should be understood that the total steam pressure on the back of the valve is greater than the pressure of the valve against its seat; see sixteenth paper.

Railroad Shop Notes.

At present the New York elevated railroad is having built twenty-five new locomotives at the Rome Locomotive Works, N. Y.

The boilers for these engines will have Belpaire fire-boxes, which we illustrate. Fig. 1 is a longitudinal section; the right-hand side of Fig. 2, represents the back end, and the left-hand side a section through the fire-box, and Fig. 3 represents the manner of bracing the back end and outer crown of boiler.

The success of these boilers is assured, since an engine with a Belpaire boiler is now running on the road, giving excellent satisfaction, and it is claimed that better results are obtained from this boiler than from the boilers previously used.

The dimensions of the cylinders for these engines will be 12 inches in diameter, and 16 inches stroke. We believe that 12″x16″ cylinders are admirably adapted for engines on elevated roads on which many stops at short intervals have to be made.

A few rails with the ends cut to an angle of about 45 degrees, instead of being cut off square have been laid on this road. So far these rails have given satisfaction, but how long these rails will remain in a good condition is not yet known, as these have not been in use for a sufficient length of time.

A reader sends us the following item clipped from some paper the name of which we do not know:

"John Chinaman, with his usual shrewdness, has hit upon an article of export from Germany which has thus far escaped the attention of the enterprising Teutons. It is neither more nor less than cast off horseshoes, of which some Berlin firms are about to ship some 3,000 to 4,000 tons. The 'heathen Chinee' has found out that the wrought iron of which horseshoes are made, owing to the constant and even hammering on the pavement, together with the equine animal heat, gradually assumes hardness of steel, combined with great malleability and elasticity, qualities which fit them more especially for the manufacture of knives and sword blades."

Recently a cargo of 188 tons of pig iron from Birmingham, Alabama, was shipped from Charleston, South Carolina, to New York. This is said to be the first cargo of pig iron ever shipped from Charleston, and is the beginning of a trade which promises to be one of the most important in the South.

A New Subsidy Senator.

One of the newly elected United States Senators, C. B. Farwell, of Chicago, is a subsidizer of the most pronounced type. He is reported as saying in an interview: "If it will cost $1,200,000 to build a vessel, and the builder has only $1,000,000, then I am in favor of the Government voting the $200,000 to complete the ship."

This is right to the point. Let a company of capitalists raise a large sum of money to go into the shipbuilding business, and Mr. Farwell would give them twenty per cent. additional out of the public treasury. This policy would soon get rid of all "surplus revenue," and make capitalists more wealthy. If shipbuilding should become too much crowded, it would be an easy and natural transition to give part of the surplus to capitalists going into the coal mining, cattle raising or other lines of business. As for spending money to fortify our coasts, so as to protect this country from foreign invasion, statesmen of the Farwell variety would probably consider it extravagant and unnecessary.

In a general review of the Scotch iron trade in 1886, *Engineering* regards somewhat confidently that year as the last of a series of years of a depression which has affected many branches of trade and industry. It then points to some of the effects and the cause of the dull time in the early part of the same year, and further states: "When the autumn arrived, however, it was found that the slow but steady development in trade in America had begun to make itself felt in this country, evidence of which was seen in the demand for hematite, for rails, for Scotch special brands of pig iron, and for old iron material of various kinds. The Scotch market then began to improve in a material degree, and prices steadily advanced."

We are glad of the fact that Americans are able to help the Scotch to better times. But would it not improve trade and industry on this side of the Atlantic, particularly in the United States, if all this material was obtained right here, and none imported?

Where a Standard is Needed.

Having inquiries as to the standard for hose couplings, with a view to finding out just how the matter stands at the present time we wrote an old and well-known fire engine company, from whom we received the following reply:

"In reply to your favor of yesterday, there is no universal standard for hose couplings, but there is no end of private standards. The ones most in use are known as the New York, Chicago, Boston, Philadelphia, National, etc. But when we furnish work for departments we get a sample of the couplings in use, or if they have none we give them one to suit our convenience. If possible we make it like those in the cities near them. Some years ago the National Association of Fire Engineers adopted a standard which they described carefully in their printed reports. It has never been adopted by departments generally, and never can be. No two builders who followed the directions made exactly the same thread, so where two towns are using the National standard the chances are they would be found so different that they would not connect. It would be very nice if all could be alike, but we do not see any way by which it could be brought about.

BUTTON FIRE ENGINE COMPANY.
Waterford, N. Y.

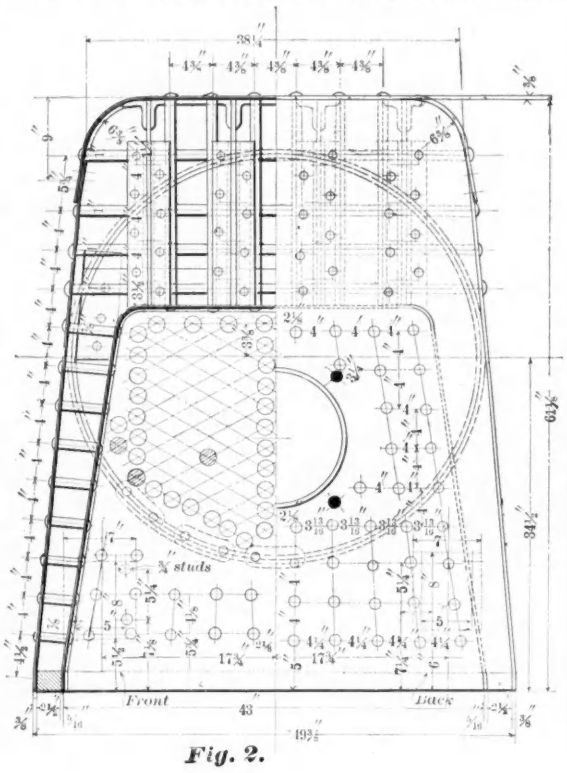


Fig. 2.

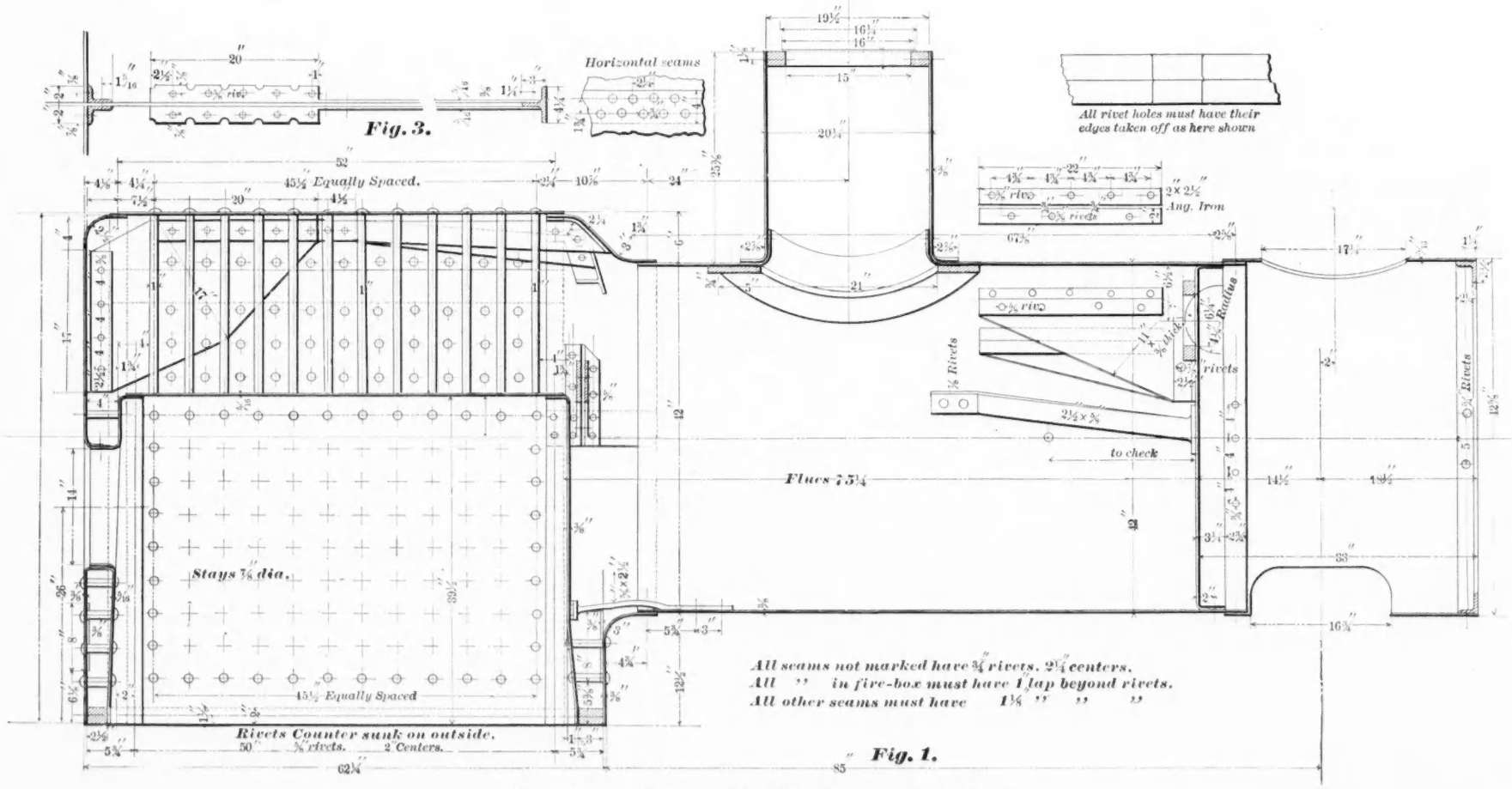

Horizontal seams
Fig. 3.
All rivet holes must have their edges taken off as here shown
45½″ Equally Spaced.
Stays ⅞ dia.
Flues 75¼
to check
Rivets Counter sunk on outside.
50″ ⅞″ rivets. 2″ Centers.
All seams not marked have ¾″ rivets. 2¼″ centers.
All ″ ″ in fire-box must have 1 lap beyond rivets.
All other seams must have 1⅛″ ″ ″ ″

Fig. 1.

BELPAIRE FIRE BOXES ON NEW YORK ELEVATED RAILROAD.

The *American Miller* says: "We do not know what degree of probability there is in the rumor published on another page, in regard to the consolidation of all the milling interests of Minneapolis into one huge stock company, with a capital of ten million dollars. Of course such a move would be in exact accordance with the tendency of the times. It would be a benefit to the smaller firms in Minneapolis; and right there seems to be where the shoe pinches."

A Western contemporary intimates that the "Triple Thermic Motor" has not been heard of to any great extent as yet. Our impression is that there are a good many who wish they had never heard of it.

In 1883 the shipbuilding on the Clyde was very brisk, the output amounting to 419,664 tons; in 1886 it amounted to about one-third of this.

LETTERS FROM PRACTICAL MEN.

Making Bells—Trouble With Pulleys.

Editor American Machinist:

If D. B., who has a lot of scrap iron and wants to cast bells, will, if his scrap is good, use 30 lbs. of old horseshoes, or other good quality of scrap wrought iron to each hundred pounds of cast scrap, he will get bells almost as good in quality as those made of steel.

While in charge of a foundry in New England, I had some 24-inch pulleys, 2-inch face, to make; these pulleys were to be finished by piece work, and there was not much superfluous stock in the rim. I gave them to one of the best moulders in the shop to make; he made nine moulds, and cast them by running from the hub. When the machinist tried to finish them he found them so hard in spots that he could not turn the rim. The iron used was No. 1 Summerlee Scotch and South Easton American, and No. 2 Crane for strength.

I passed the pulleys around the shop with the same results—always too hard. I blamed the moulder for using his sand too damp, and also for ramming too hard on top of the face—a not uncommon fault.

I then gave them to another moulder, and instructed him instead of running them on the hub with one ladle to use two hand ladles and run them in the arms. Doing this the iron in the rims was soft as could be desired.

The instruction I draw from this is: the quicker you can fill a light mould the softer you can make the casting. In pouring fr

the hub, half the hub had to be filled, then the iron would flow through the arms to the light rim until the mould was full; the last iron, that filled the upper half, or the rim, was the part that was hard, from flowing through the arms into the rim.

While working for a tool company, some years since, I had a good many small pulleys to make that gave me much trouble from cracking in the arms. I concluded that it came from the heavy hub, and as I was one of the first men to pour off, after casting these pulleys I turned the flasks up on the side, took off the bottom boards, dug out the core and cleaned the sand away from the hub, leaving the hub to cool before taking out of the flask. The result was no more breaking of arms. DAVID SPENCE.

Points About Patternmaker's Lathe.

Editor American Machinist:

I know of no mechanical paper that offers the encouragement for practical mechanics to write up and exchange ideas from their special trades, to the end of the advancement in the art, and the greater economy in manufacture that the AMERICAN MACHINIST does. Every mechanic has a different taste and different experience, and so it follows that I differ from Mr. Barrows in much of the matter, and also in his treatment of the subject of pattern-making. In criticising the points he makes, I will try to treat them as I wish mine to be treated, that is, not find fault without trying to show what I think is a better way.

I think Mr. B. takes up more time and labor in describing the ways of poor workmen and poor tools than the best ways and best tools. There are 50 poor ways to do work where there is but one best way in our individual opinion, and to give the writer's best way, or the points and qualities of the best machine, would be much more profitable reading. A better form of driving center, I think, than Fig. 75, which Mr. Barrows thinks is best, is the one I show in Fig. 1 and 2, full size for a 12″ lathe. One lip is dressed square while the other is slightly rounded, the flat face being kept on one side and outer edges. It is easily made, being flattened from taper shank, and when the lips get damaged requires only filing down and truing to renew them. It contains all the qualities of Fig. 75, with this addition: The lips being re-turned on the edge makes it less liable to be knocked out edgeways. The lips are solid and are much cheaper to make or repair.

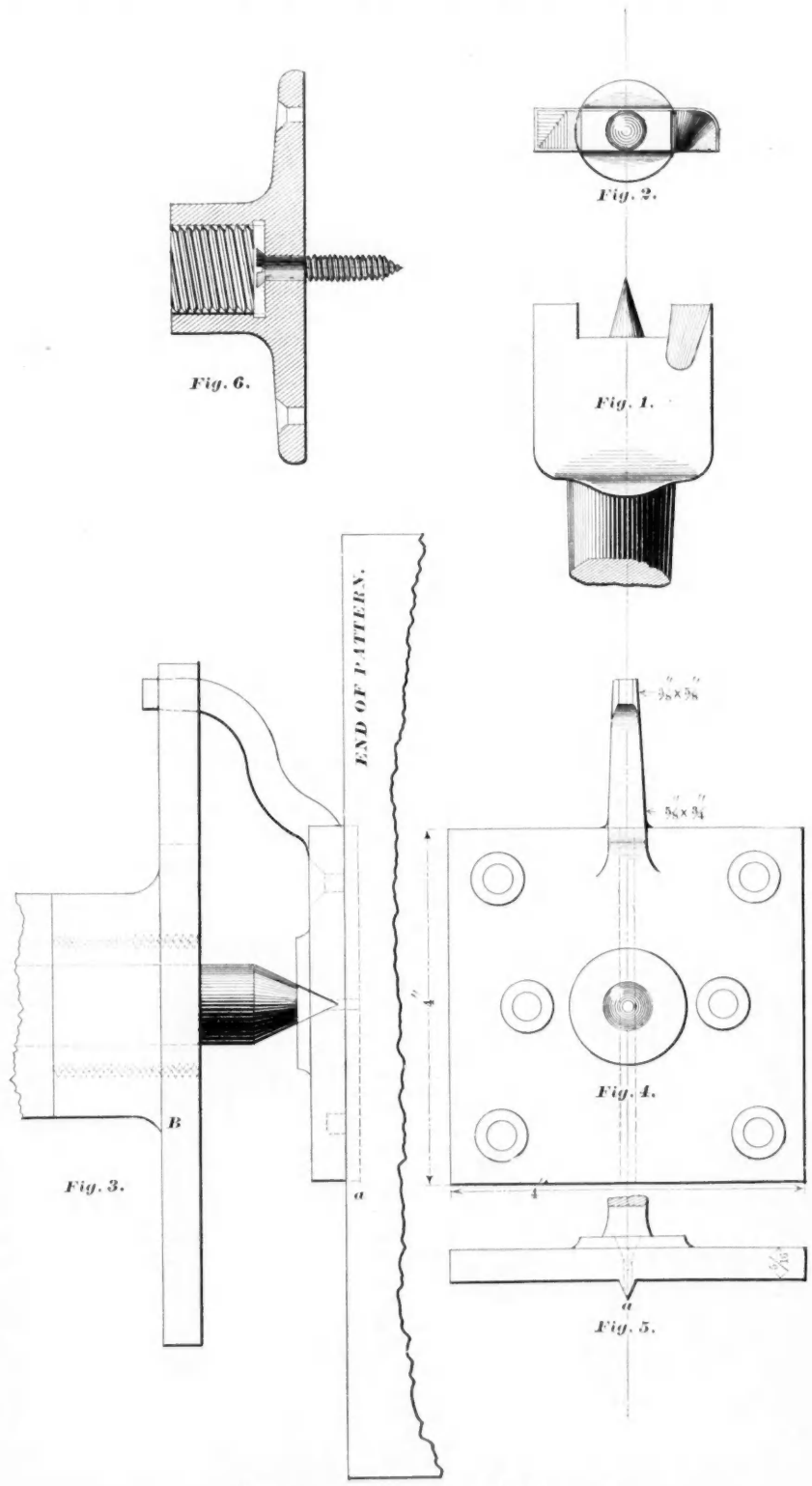
In the next paper, under the subject of split patterns, it is well to mention the various ways in use to hold the halves together while being turned, as the gluing or screwing each of the pieces together, to which might be added, in case of light and long turning, the method of gluing the whole joint with paper between, to insure it from springing open in the center.

In treating large split patterns much labor and space is used to show a bad principle of driving by a face plate and the results, but in it all he fails to give an example of a proper way of driving the work. I could give many illustrations of poor ways, but I will try to give you the best system I have met with, which I think cannot be beaten in its universal application. Its form and application is shown in Figs. 3, 4, and 5.

The face-plate *B*, Fig. 3, has an open slot in it, to receive the horn of the center-plate freely, the horn being solid with the plate. The proportion given is for wrought iron and is suited to the heaviest ordinary work of a pattern shop. The face is planed and a center lip is left, as shown at *a*, Fig. 5, which, by taking the edge of the joint of pattern, will fit exactly in the joint and will hold itself there while a pin nail through the center will locate it the other way until it is screwed fast. I would not adopt an inferior plate for tail center, because some workmen do not always attend to the simplest part in oiling it, for even wood centers rightly used require to be oiled, but rather to enforce an experience with good tools upon the men. It should be the duty every morning of some one to oil and look over the shop tools. When it is everybody's duty it is not done.

The most useful face-plate chuck for small work is not mentioned by Mr. Barrows; that is the screw face-plate, as shown in Fig. 6. The screw is a common wood screw, and is driven tight in a hole in the center of plate so that it can be renewed easily when the thread is worn. A hard wood plate screwed on a small chuck is sometimes used, when there is not an iron one suited, and a screw fastened into the hard wood. This is very useful for flanges, hubs, prints, etc.

In the next paper Mr. Barrows decribes a chuck he has made himself. I do not doubt its originality, but I must say that I never



POINTS ABOUT PATTERNMAKER'S LATHES.

met with a piece of pattern work where I could have used it to any advantage whatever. I asked the opinion of the rest of the patternmakers in the shop with the same result. I would now appeal to Mr. Barrows to show wherein he has found it useful; certainly not in making horn gates, as he illustrated. If it was used "to drill circular rows of holes in a plate," as suggested, it would require a new arrangement of face-plate to set it upon the tail spindle or cut a thread upon it like the live spindle. It seems to me a device that it would be hard to find something it can do, and the only reason I can see that entitles it to the name of a patternmaker's chuck is that it is owned by one.

ISAAC WHITEHEAD.

Providence, R. I.

[In telling how to do work it is often desirable to point out bad ways when such ways are often followed. Mr. Barrows has done so quite successfully.]

Difficulties in Pumping Water.

Editor American Machinist:

I have just read with much interest the letter of your correspondent E. D. Davis. It appears from his letter that he neglected to put a vacuum chamber on his suction pipe. Last December I had occasion to set up a single acting plunger pump to draw water from a well two hundred feet distant and force fifty feet above pump. I was pressed for time and neglected to put in a vacuum chamber. On starting the pump it worked just as Mr. Davis describes; the cylinder would half fill with water and there was a heavy bump to the suction valve which could be distinctly heard in the well; also a heavy jar along the whole length of suction pipe which would have caused every joint to leak air in a short time. I allowed the pump to run just five minutes, when I went to work and made a vacuum chamber of a piece of pipe the same size as suction, five feet long with a cap on the top, well leaded. The pump then worked smoothly and noiseless and discharged a cylinder full of water at every stroke, which it has continued to do ever since.

The foot valve, standing knee deep in ice cold water with the thermometer at thirty, is not pleasant and not necessary. The proper place for such a valve is close to the vacuum chamber. Then it is easy to repair, always gives evidence that the pump and pipe are full, and detects any leak of air in suction pipe. We have at Clarendon Mills a Blake condensing pump with cylinder 16x16, and a Knowles steam cylinder 10x16; when first erected a foot valve was put on end of suction pipe. The pipe is two hundred feet long and six inches diameter. Every time the machine was stopped the break vacuum valve would work spasmodic, caused by the alternate pressure of air on the water in the pipe, checked by the action of the foot valve. This caused a heavy jar along the line of pipe. After two winters of this experience I put a Pratt & Cady check valve close to the vacuum chamber and took out the foot valve. The break vacuum valve now opens and remains so until the vacuum is filled, and the jar has disappeared.

The suction valve should hold the water without any valve, and will do so when air-tight, but a vacuum chamber is always an advantage, and, for a long suction, a necessity. There should also be a valve on the discharge pipe, which should be closed to keep the pressure off the pump until the air is got rid of by the air cock. As for the valves of a Knowles pump being too high, my experience is, if the conditions I have mentioned are strictly adhered to it makes no difference where the valves are. I have had them all above the barrel and all below it; and some on one side, and all on one side, and some on one end and all on one end.

CHAS. L. HOLBROOK,
Engineer Clarendon Mills, West Boylston, Mass.

Paper Scales.

Editor American Machinist:

Mr. Meyer says in a recent article: "Ivory or paper scales should not be used in a drawing office." I will content myself with saying that paper scales and no others should be used in all drawing "offices," rooms, or other places where drawings are made for machine shop use, for all purposes, and on all occasions.

No other scale is so cheap, so convenient for use, so durable, or so easy on the eyes.

It is perfectly true that of a score of paper scales 18 inches long, no two will agree exactly in total length of graduation.

It is also perfectly true that this is a matter of no consequence whatever in the production of accurate drawings.

It is also perfectly true that a draftsman who depends upon a scale in putting the sizes on a drawing will take more time, and is in far greater danger of error than the artful craftsman who ascertains the dimensions of his work by addition, subtraction, multiplication, and division.

Even in full size drawings the scale should never be depended on for measuring up the sizes; keep a scale in your hand while putting the sizes on the drawing, but use it only as a check on your figures, and to help you out on the even inches after you have settled the fractions by calculation.

The one essential of a scale for draftsman's use is uniformity of graduation. One inch should be about as long as another inch; it makes no difference whether the inches are absolute inches or something quite different; but it does make a difference in small scale drawings, if, having set off a line of measurements from the edge of the scale, the scale is moved along on the line and a discrepancy appears in the previous points, which discrepancy is due to a want of uniformity in the graduations of the scale.

No one, I think, can be found to deny that the paper scale is the most convenient to use on the board, nor that the paper scale is by far the cheapest and cleanest for the paper. Properly treated the paper scale is also the most durable and the least affected of all scales by changes of the atmosphere.

The correct scale for ordinary machine work is the paper scale, printed on bristol board, 18 inches long; scale, 3 inches to the foot. In selecting several scales, pick out those which most nearly coincide in total length of graduation. As soon as the scales reach the drawing room, give each one two heavy coats on each side of the best white shellac varnish, made with alcohol (not methyl), and if possible let the scales have twelve hours to dry before using.

Paper scales so treated are about the color of ivory, are perfectly clean and agreeable to

use, afford a hard and reliable center for sharp-pointed dividers, and can be wiped clean with a damp cloth at any time. When the scale is worn by the points of the dividers, varnish it over again. The varnish will fill the holes perfectly, and I have used such a scale a year and a half constantly before it was worn out.

No finer graduation than 16ths is needed for the drawing board; 32ds are easily read from the 16ths graduation, and 64ths are matters of conjecture only on a paper drawing which is not figured.

It is needless to state, I think, that all drawings should have every dimension, radius and center clearly defined by figures, broken lines and witness marks. Nothing should be left to subsequent shop measurement.

By all means let the cub draftsman use paper scales only and always, if he wants the cleanest and most convenient tool in existence.

EASY WAY.

A Question Relating to Pumps.

Editor American Machinist:

I would like to place before your readers a little pump problem which I recently met in my practice.

The accompanying illustration shows the general arrangement: *a b* and *c d* are iron pipes; *b c* is a sewer pipe jointed together as tightly as possible. When all was put up and finished, we found the pump to work in every respect most satisfactory; all the water which the pump could draw was running out at *d*, thus showing that the pipes were of sufficient size. A few hours after this trial the pump was started again; but this time the water ran out through the open top of the pump, and not a drop discharged at *d*. What was the matter? and what is the remedy? This is a problem which might serve your readers as a nut to crack in leisure hours.

It must be remembered that I do not say the pipe *b c* is tight, but that it was as tight as it could be made out of this particular material.

I receive the AMERICAN MACHINIST very regularly every week in this rather remote spot on the globe.

A. F. WIKING.

Ystad, Sweden.

Difficulties in Pumping Water.

Editor American Machinist:

I have just read in your issue of Feb. 12, 1887, Mr. Davis' account of an unsuccessful attempt to draw water through a two-inch pipe 800 feet long with a rise of 16 or 18 feet.

Being fresh from a law-suit, in which the friction of water in pipes was an important factor among other matters presented for the consideration of the learned court, I am well prepared to show that, providing Mr. Davis' pipe and connections had been air tight, his water supply could not have been otherwise than unsatisfactory; and this in consequence of the friction from so long a pipe, and also from the loss of driving force which occurs in consequence of the high lift of 16 feet.

There are those—though I do not class Mr. Davis among them—who believe that if sufficient pumping power be applied, water may be drawn to any distance and to any height by suction.

The use of the terms draw and suction, even by those who know that, strictly speaking, there is no such action in a pump, is continued, because we have no short word in the language which expresses the idea that it is the outside pressure of head of water above the pump, or the atmospheric pressure above the water, or both pressures together, which force the water into the pump when its piston is moved; and these pressures are produced by the eternal attraction called gravitation. What gravitation is nobody knows.

The motion of water in the suction pipe of a pump is produced when the piston is moved, by the pressure of the atmosphere acting upon a surface equal to the sectional area of the pipe.

The atmospheric pressure ordinarily is 14.7 pounds per square inch.

The weight of a column of water 1″ square and 1′ high is .434 pounds.

Mr. Davis lifted his water 16 feet, then $.434 \times 16 = 6.94$ pounds, and $14.7 - 6.94 = 7.76$ pounds per square inch pressure available for driving the water through the length of the pipe.

The friction of water against a tolerably smooth surface when moving with a velocity of 10 feet per second, is .45 pounds for each square foot of surface, and varies as the square of the velocity. Thus if the velocity be raised to 20 feet per second, the proportion will stand,

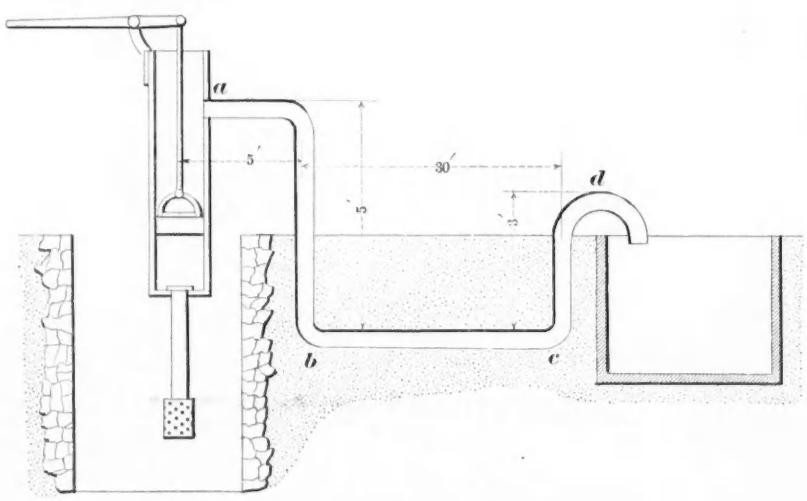
$(10^2 = 100) : (20^2 = 400) : : .45 : 1.80$ pounds.

If the velocity be reduced say to 5 feet per second the proportion will stand

$(10^2 = 100) : (5^2 = 25) : : .45 : .1125$ pounds.

Taking the internal circumference of the 2-inch pipe at half a foot, we have $\frac{800}{2} = 400$ feet of wetted surface to resist by its friction the rope of water passing through, and if the velocity had been 10 feet per second the total frictional resistance would have been $.45 \times 400 = 180$ pounds, which would have been the total strain on the end of the rope of water required to keep it in motion; or, what is the same thing, a pressure of 180 pounds on the cross section of the 2-inch pipe, which has 3.14 square inches area, or about 57 pounds per square inch.

Now, the available pressure has been shown to be 7.76 pounds per square inch, and $7.76 \times 3.14 = 24.37$ pounds total pressure, and $180 : 24.37 : : (10^2 = 100) : 13.5$.



PUMP PROBLEM.

$\sqrt{13.5} = 3.68$ feet per second, which is the velocity the water in the pipe will have, when its friction is overcome by the unbalanced atmospheric pressure of 7.76 pounds per square inch.

There are 12 inches in a foot and 60 seconds in a minute.

Then, $3.68 \times 12 \times 60 \times 3.14 = 8{,}320$ cubic inches.

There are 231 cubic inches in a gallon according to act of Congress.

Then, $\frac{8320}{231} = 36$ gallons per minute, which is the greatest possible quantity that such a pipe can supply by the atmospheric pressure.

By a similar calculation applied to a pipe 4″ diameter, 800 feet long and with 16 feet lift, I find the greatest quantity possible to be 51 gallons per minute.

From a 2″ pipe 800 feet long, without any lift at all, the flow by the action of the total atmospheric pressure will be at the rate of 50 gallons per minute.

A steam pump with 2″ suction pipe is rated at, say, 100 gallons per minute, and of course a supply of 50 gallons would be very unsatisfactory.

I would suggest to people who are engaged in the pump business, that they publish tables showing the maximum length of supply pipe in combination with the maximum lift which it is practicable to allow, and it would save their customers much loss and annoyance. I have seen many cases similar to that of Mr. Davis—usually complicated with more or less of air leakage—and each man who lays down such a pipe never tells what he has done, counting his dearly bought knowledge as too valuable to be given away.

WILLIAM H. HARRISON.

Effect of Domes on Some Tubular Boilers.

Editor American Machinist:

In No. 51 the writer made some comments on an article by Mr. William Lowe on domes, and quoted the result of a test on some tubular boilers without domes, and inquired how much a dome would have improved it.

Instead of replying to this Mr. Lowe proceeds to intimate that that test was not reliable, the principal reason being that it was not of sufficient length.

I would like to refer him to the tests at the Pacific mills, by Mr. Hoadley, which were weekly tests and continued for a number of weeks, when equally good results were obtained with a percentage of entrained water of a trifle over one per cent.

Another thing, he compares the evaporation per square foot of heating surface of the tubular with that of some plain cylinder boilers, which is unfair, for the reason that the tube-heating surface is not as efficient as the shell. The tubes of a boiler are simply one form of an economizer, and their efficiency as heating surfaces very much overestimated.

In Mr. Hoadley's experiments he showed in his warm blast boiler that the heat at the fire was 2,796°, at rear of boiler 895°, and smoke-box 377°, or that the shell of the boiler had taken up 1,901°, and the tubes 418°, or but little over $\frac{1}{5}$. The cold blast nearly the same proportion. Should this fact hold good in all cases, as there seems to be no reason why it should not, the boiler tested by Mr. Hill would have 131.6 square feet heating surface on the shell, and 1,098 in the tubes, but the 131.6 has evaporated nearly five times the water that the 1,098 feet, so that under no possible conditions can a tubular boiler evaporate as much water per square foot of heating surface as a plain cylinder, but the tubes acting as an economizer it will be more economical.

Mr. Lowe claims that he has put on domes for years without accident. I think he would hardly claim that a boiler with them was as strong as without.

There is a builder of tubular boilers in New England that a few years ago had a large trade, and I think he makes the claim to-day that none of his boilers ever exploded. It was not an uncommon thing for an inspector to find that the inside courses of a boiler sold for $\frac{5}{16}$″ iron was only $\frac{1}{4}$″. Some rivets cut out of the boiler under the writer's observation had the appearance of being partially sheared.

It could not be claimed, because none of these boilers have exploded, that it was a good enough way to build them.

Another point that is made, that where a boiler is worked hard it is necessary to carry the water high, calls attention to the practice of some boiler makers who believe in slow combustion. In order to have the boiler work up to its rated capacity, a large grate area is necessary; and add to this the idea that adding to tube area adds to the heating surface, the boiler is crammed full of tubes, and when the customer builds hot fires, there are the conditions necessary for a badly priming boiler. A dome may partially remedy the priming, but it does not prove there are not boilers designed, set and operated in an intelligent way that give just as good or better results, and that domes on this class are not necessary.

W. E. CRANE.

The Humbug Postal Note.

Editor American Machinist:

In your issue of Febuary 12th I find an editorial with the heading "Boycott the Postal Note." In it you say, "It is a swindle. No matter how well it is known by the Post Office officials that a particular postal note has been lost or destroyed, and that its amount remains undrawn from the Government vaults, no duplicate can be procured under the law, and the money is forever lost to both the sender and the sendee." I was interested, because I had a case pending at the time. Last June a postal note was paid me, which, in making change, I passed to a third party. Instead of presenting it for payment he retained it six months and returned it. He had, furthermore, signed the receipt on it with his own name. I presented it to the postmaster where payment was due. He noticed at once it was overdue, and by the law null and void. But as it had not been canceled at either office the issuing or receiving office he said by the law it could be renewed. It was sent to Washington, and promptly came back the order to duplicate it, and if not presented for payment in three months to triplicate it. The amount was not large, nor was any influence brought to bear to secure the result. I think the article in question, if not calculated to do injustice to the Post Office Department, might, at least, discourage some citizen from making an effort to recover upon a lost or an overdue postal note. In making the note payable at any money order office they will be easier to collect, but easier to lose. I agree with you that a postal order is better, for the office issuing it sends an advice to the paying office, with the name of the drawer, which does not appear on the note itself, but resembles in that respect a note drawn to bearer. A little care in sending a remittance would make it as safe as sending a check.

D. N. FREELAND.

Pelham Manor, N. Y.

Drilling Long Holes.

Editor American Machinist:

From time to time I have noticed articles in the AMERICAN MACHINIST about drilling long holes. Some of the writers favor the "hog nose," and some the twist drill. I have just finished drilling 106½ feet, each hole being 42 inches long. The first 18 inches of the holes was $\frac{5}{8}$ inch diameter, the remainder being $\frac{17}{32}$ inch.

I will first give my experience with the hog nose drill. The stock to be drilled was Bessemer steel, and being piece work, I naturally wanted to do the drilling in the least possible time. The holes were to be used for oiling purposes, drilled in the center of shaft, with one end clamped to live center, and the other end running in center rest. Drilling was done in ordinary Pond lathe, 20″ swing. I got all ready for my hog nose to start, and it rooted pretty good, made a nice smooth hole; used lots of lard oil. After I had drilled about 14 inches, the shaft began to warm up. There was no trouble in removing the drill; but after I had removed the drill and washed out the cutting, which I did with oil, I could not get the drill to bottom of hole again. This was due to the contraction of metal. I then had to use the drill as a reamer. Well, I tied some waste around the shaft, and kept it well soaked with cold water. Then everything worked lovely again for awhile—no expansion or contraction; but as I couldn't swim, I thought it best not to flood the shop, so I abandoned the wet waste and the hog-nosed drill at the same time. It took me about two hours to drill 18 inches. I then tried the Morse twist drill, which, by the way, was a $\frac{17}{32}$ drill of ordinary length, welded to a half-inch rod of steel, the proper length. The $\frac{5}{8}$ drill was made in the same manner. Time drilling first 18 inches was 40 minutes, and the remainder of the hole was drilled in 50 minutes, the $\frac{5}{8}$ hole being drilled with shaft re-

volving 110 revolutions per minute; for $\frac{17}{32}$ drill one speed faster, or 158 revolutions per minute; time total for drilling 42 inches in depth, 1 hour 30 minutes. That, of course, is the best time I made. I did a number of them in less than two hours. The best ten hours' drilling, including changes, was four holes, or 168 inches.

I have used the hog-nosed drill on cored work, but never undertook to drill into the solid before, and never will again, unless time is no object. The $\frac{5}{8}$ holes were drilled with oil; the $\frac{17}{32}$ holes were drilled dry, excepting what little lubrication the drill required to prevent cutting the sides or body. In drilling dry, I had no trouble in removing chips, whereas with oil it was almost impossible to remove them. Yours respectfully,

J. L. OEFINGER.

Stamford, Conn.

Patternmakers' Lathe.

The lathe which we illustrate herewith is a very complete one for the purpose. It is a solid and substantial tool, fitted up for convenience in doing patternmakers' turning.

It has a swivel head-stock, for convenience in turning draft or taper on work fastened to the face-plate.

The head spindle is hollow, having a $\frac{13}{16}$-inch hole through it; the spindle extends beyond the outer box of head-stock, and is provided with a face-plate for large work.

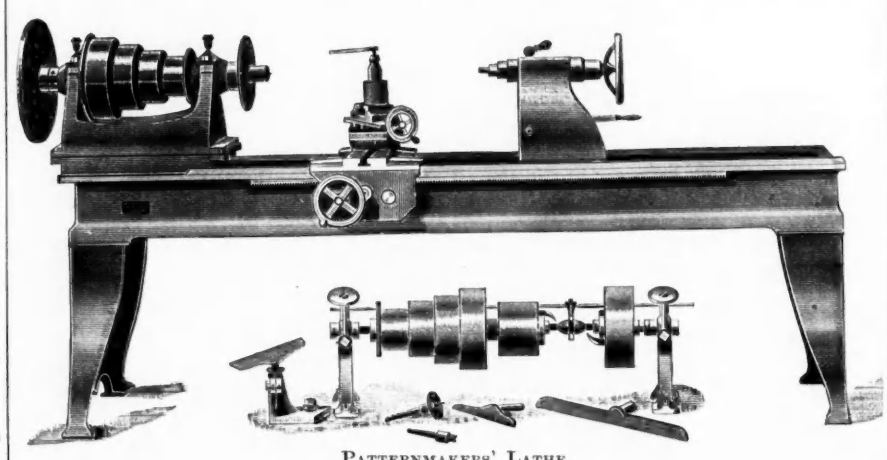
The carriage has hand feed, by rack and pinion, the entire length of bed, and is fitted with a compound slide rest.

The tail spindle sets over to turn taper work between the centers.

The cone has four changes of speed for a 3-inch belt, and the countershaft has two friction pulleys of different sizes, giving eight changes of speed, four of which are comparatively slow, for turning work on the large face-plate while four are quicker, for smaller work.

The lathe swings 24 inches over bed, and 20 inches over carriage. The distance between centers, with an 8 foot bed, is 5 feet 10 inches. The friction pulleys on countershaft are 6 inches, and 10 inches diameter. Rests for hand turning are furnished, as shown in the engraving; also a tripod rest for use in turning work on the outer face-plate.

The manufacturers are Fay & Scott, Dexter, Maine.



PATTERNMAKERS' LATHE.

Prejudice Against American Goods.

BY S. W. GOODYEAR.

Your editorial in issue dated Feb. 5, 1887, "Prejudice in Favor of Imported Goods," hits the nail squarely on the head. Have you space for a few blows in the direction of driving it home? For the past quarter of a century there has been, on the part of many, a constant and most determined opposition to the introduction of certain goods of American manufacture, the production of industries which have sprung up during that time. As the writer has held a position where the opportunities and necessities of business have opened the door on the difficulties attending the introduction of American steel, or of instruments made from imported steel, but unfortunately it would seem made by Americans, this letter will be devoted to a showing up of some of the fallacies, prejudice, apparent malice, or self-interest through bribery (?) which have stood in the way of progress.

It is unquestionably the fact that in a majority of cases the supplies, in the way of steel, or tools made from steel, for our manufacturers, are purchased directly by men, whether proprietors or salaried officials, whose practical knowledge on the subject is too limited for intelligent discrimination between the good, bad and indifferent qualities brought to their notice, and urged upon them by pertinacious salesmen.

Naturally, then, these men turn to practical men in their employ for advice as to what shall be bought and used. To say that the prejudice against American steel, or tools made from it, is born of national bias, would hardly be fair, since there are native-born Americans, descended from the Puritans, working to-day in sight of Plymouth Rock, who can neither be coaxed, driven or bribed to use American steel, or to say a good word for it, while there are English, Scotch, German and Swiss mechanics, with those of many other foreign nationalities, using home-made steel from choice.

During the sixties the writer had brought to his notice, by a friend, the proposed manufacture of an article made wholly of steel, largely used by many manufacturers, and up to that time imported exclusively. There seemed to be everything in favor of the proposed enterprise. The demand was extensive and constant. To produce the goods in exact duplication of the imported article was easy. The material to be used, being in the shape of drawn wire, was to be imported, for up to that time American wire manufacturers had not, as now, demonstrated their ability to produce as good steel wire as any in the world. The outlay for machinery and tools of special character to produce the goods was quite heavy. Months were spent in perfecting the appliances, and improving the facilities for turning out the work in the best possible manner, and finally, with samples of the goods put up in the most tasty style, after the fashion of the imported article, the goods themselves being in the judgment of the manufacturer, himself a skilled mechanic, and of all the mechanics employed by him, or to whom he proudly showed the goods among his friends, really superior to the foreign samples by which they were made. There was an effort made to put them on the market. It was no use. Manufacturers operating machinery in which the articles in question filled a place like that filled by the needle in the operation of sewing machines referred the matter to the men in charge. These men at that time were almost exclusively those who believed implicitly in the superiority of English goods and strenuously opposed the introduction of American goods in their place. The fact that English steel wire had been used had no weight. The only thing that could be done by the would-be establisher of a new American industry was to put samples of his goods in the hands of different consumers for trial. Then came the difficulty of getting them put in use. Visit after visit was made, to meet with the report that as yet the goods had not been tested, and finally, as at one place after another, through his pertinacity, backed up by the orders of employers, our friend began to get reports, he was astounded to learn that his goods were declared to be utterly worthless. In the meantime they had been accumulating. Of course if the report was favorable there must be a stock on hand. Many councils of mechanical judgment were held. Size, shape, finish, temper, elasticity, ultimate strength, and all other distinctive features were discussed. Comparisons were made between the American and English goods by every means available, and the verdict was that in all essential details the home production was really the best. The only blot seemed to be that it was American. In the endeavor to suit prospective customers who assumed to tell why the little instruments failed to work, and who thought if certain alterations in shape or modifications of temper were made, success might follow, there was a long continuation of experiments made, but all to no purpose. Finally a plan was hit upon to test the genuineness of the opinions so freely expressed that the ——s made by the —— company were "good for nothing." An importer and dealer in the goods in question was a willing party to the little deception practiced. The English made goods were removed from packages in which they were imported and those of American make were put in their places, while the English goods were packed in the unmistakable American paper boxes of the unfortunate who had dared to suppose that reliable goods could be made here.

Through the dealers' hands the veritable American article went into the same hands where identically the same thing had been condemned, and with the request that this particular lot should have a special trial, and a report be made, as there was supposed to be a variation in quality from former lots, the result was awaited. The report was that the ——s were the best they had ever used. The next move in the game was for our American manufacturer to induce these infallible judges to give his goods one more trial, and the simon pure English goods taken from American packages were condemned as promptly as those of his own make had been.

This is a plain statement of fact. The business had to be abandoned. There might undoubtedly be thousands of just as strange experiences related. I once induced a Scotchman, a superintendent of a large works, to try an American prepared article of English steel in place of the universally acknowledged standard English imported article. His report was unfavorable. After some changes in manipulation, whereby a really better thing was believed to have been produced, and with hundreds of customers saying, "better than the imported," I asked this same superintendent to favor me with another trial, which he did, and condemned my sample pieces as he had before. As a means of testing the question of possible prejudice, I had other pieces, parts of the same bars, tested by other parties who pronounced them "all right, as good as they had ever used." Just then I tried an experiment. From an importer of the genuine English goods I procured some pieces, seeing the unmistakable imported packages opened to avoid any possible mistake, and with a little rubbing of emery cloth and fixing of ends I had what would pass for the American prepared product, but was the true imported article, and begged the favor of a third trial. It was made. The report was that there was no use trying to substitute anything for the old reliable article, that this last lot was worse than either of the others.

Quite recently I had a very interesting interview with a steel-worker who furnishes forgings for dies, etc., to large numbers of manufacturers. Said he: "I commenced using American steel to a considerable extent fifteen years ago; have used it continuously ever since for some customers. Some customers object to its use, and insist upon having their work made of English steel. Of course I have no alternative, and have always dealt fairly with my customers, giving them just what they ask for. There was a time when I did not know what to think about the American steel I was using. I heard a great deal said by others about lack of uniformity, failure to harden, difficulty of annealing and cracks in hardening American steel, but for a number of years the customers whose forgings I made from this steel went along with no complaints, and if any opinion was called for by me there was a universal expression in favor of —— steel. The time came, however, when the largest consumer of this steel among my customers, the one who had been first to take it up, and through whose recommendation others had adopted it, complained that it did not harden well in his expensive and intricate dies. I was charged at first with having changed the steel. This was untrue. I next stated the case to the manufacturers. They replied that no change had been made, that the steel was identically the same. Setting myself to learn, if possible, where the trouble was, I begged permission to investigate. I found the methods for heating and cooling unexceptional. I was assured that no change had been made in the treatment, but that going through the same process which had formerly hardened their dies evenly and thoroughly, now left them with soft spots and in an entirely unreliable condition. I was in a quandary. Like a drowning man catching at straws I brought up all sorts of possible reasons, among others even asking if the water used to quench in did not come from some new source, but I found no ground on which to base a reason. 'It must be in the steel,' said my customer, and I could not further dispute. Just at this point my attention was called to some boneblack with which the faces of the dies were coated to protect the fine lines and projections during the heating process. 'It had always been used and was a good thing,' I was told. Said I, that is not boneblack, it is lampblack. The riddle was solved. Some boneblack was obtained; the steel hardened as well as ever. This was years ago, and the same party is still having his forgings made from American steel, but there are lots of customers who will not touch it."

But, Mr. Editor, and readers of the AMERICAN MACHINIST, I suppose I ought not to further trespass upon your patience; still, I would like to ask if it don't sound a little strange to hear men say that they use English steel altogether; don't doubt but American steel is just as good, but don't like the risk and trouble of changing, when these same men are in favor of a protective tariff to encourage and promote American industry? And is it not quite as strange to hear strongly-expressed statements that American steel is inferior to English, when the fact is that our best American steel is made from the best of Dannemora and other Swedish iron with as much care as can possibly be bestowed upon steel manufacture even in Sheffield? Once more. Setting aside all assumptions, all apparently inferentially reasonable conclusions, is not the fact that thousands of mechanics are using American steel with entire success for the finest of tools and in the most trying places evidence that the steel is all right? How long will it take for some proprietors and managers to learn that through the influence of men in their employ they are led to pay out more money for fancy brands, and unduly-lauded manufactures of foreign steel, than would provide them with just as good steel of home production, and does not home production and its encouragement and patronage stand for national prosperity and advancement?

Method of Bronzing Iron.

A German technical journal gives the following method of producing a bronze-like surface on iron or steel, which prevents rust: The object to be acted upon must be cleansed, so as to take off all oxidation or other impurity. It is then exposed for two or three minutes to the action of the vapors of a heated mixture of hydrochloric acid and nitric acid in equal portions at a temperature ranging from 550 to 650 Fahr. After the objects have cooled they are to be rubbed over with vaseline, and again heated until the vaseline begins to decompose. This treatment with the vaseline has to be repeated once. Should a lighter coloring than bronze be desired, it can be produced by mixing acetic acid with the other acids.

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NEW YORK, FEBRUARY 26, 1887.

CONTENTS.

	PAGE
Multiple-Spindle Automatic Drill Press	1
Edge Moulding or Shaping Machine	1
Opportunities Young Mechanics Should Not Lose	1
Suggestions in Machine Design. By A. J. Shaw.	1, 2
Modern Locomotive Construction. By J. G. A. Meyer.	2, 3
New Binder for American Machinist	3
Casting Ornamental Iron Work	3
Railroad Shop Notes	4
A New Subsidy Senator	4
Where a Standard is Needed	4
Letters from Practical Men—Making Belts: Trouble with Pulleys. By David Spence—Points About Patternmakers' Lathe. By Isaac Whitehead—Difficulties in Pumping Water. By Charles L. Holbrook—Paper Scales. By "Easy Way"—A Question Relating to Pumps. By A. F. Wiking—Difficulties in Pumping Water. By William H Harrison—Effect of Domes on Some Tubular Boilers. By W. E. Crane—The Humbug Postal Note. By D. N. Freeland—Drilling Long Holes. By J. L. Oefinger.	4, 5, 6, 7
Patternmakers' Lathe	7
Prejudice Against American Goods. By S. W. Goodyear	7
Method of Bronzing Iron	7
Factors of Safety for Steam Boilers	8
Premium Sewing Machines	8
The International Maritime Exhibition	8
The All-Powerful Coal Companies	8
Literary Notes	8
Questions and Answers	9
Manufactures	9
Machinists' Supplies and Iron	10

Factors of Safety for Steam Boilers.

In a recent issue we briefly intimated that the present allowable pressure on steam boilers approximated the safety limit. We do not believe that steam users fully appreciate the small margin of safety upon which boilers are frequently used, and do believe that a better knowledge of the subject would sometimes induce better care and management. A belief that the factor of safety is large is likely to lead to carelessness and neglect, and these are accountable for most of the disastrous boiler explosions. Nothing is worse than a false feeling of security.

It is common to hear the factor of safety of six (referring, of course, to the strength of the solid sheets) spoken of in connection with boilers in a way to lead steam users, who cannot be expected to go deeply into the subject, to believe that the pressure of steam on their boilers is only one-sixth of that which would prove destructive. Of course nothing of the kind is true; how much it lacks of being true is worth thinking about.

The present practice in fixing a limit of pressure for cylindrical shells is to allow a so-called factor of safety of six, then to increase this pressure 20 per cent. for double-riveted longitudinal seams. This reduces the factor of safety to five. But this still refers to the strength of the solid sheets from which the shell is made, and assumes all the material to be perfect, which is very likely not to be the case. Upon this part of the subject the following from *The Locomotive* is pertinent:

There is now a large iron plate, in the collection of defective material in this office, which came from the establishment of a manufacturer noted for the excellence of his boiler plates. It was put into a boiler by a firm of undoubted ability and honesty, where it kept its place but a short time under the ordinary circumstances, when a slight, but peculiar defect was discovered by the inspector, and on careful search more singular, but slight defects, were detected in the same sheet. Its removal having been recommended, it was found so brittle in places as to fall to pieces under the blows that were necessary to detach it from its place. This is mentioned (being the most recent and best authenticated of the many cases that are on record) as tending to show that no firm is exempt from the liability of sending out occasionally a defective piece of work.

Here the supposition is that both the manufacturer of the material and the boiler maker aimed to give honest work, but how much of the supposed safety factor of six did this particular sheet really have?

But assuming, for the present, that all the material is perfect, a double-riveted lap joint has only 72 per cent. of the strength of the solid sheet; and it should be noted that this strength is got on specimen pieces, which, in the nature of things, are more nearly perfect in workmanship than can be expected in the ordinary every-day practice of boiler making. Supposing, however, the workmanship to be perfect, the factor of safety is reduced to 72 per cent. of 5, or to 3.60.

Further, it is well known that if such material as a boiler is made of is exposed to a tensile strain of a little more than half its ultimate strength—varying with different kinds of material and with different pieces of what is apparently the same kind—it will stretch beyond the point of recovery, that is permanent set will occur. A strain a little beyond this, if applied times enough, will as surely eventually rupture the material as a strain just exceeding the ultimate strength will if applied once.

For general purposes, if nothing to the contrary is known, it may be assumed that a pressure equal to six-tenths the ultimate strength of the riveted joint, applied day by day, will cause a rupture at the joint. This reduces the factor of safety to six-tenths of 3.60 or 2.16, and this supposes perfect material and workmanship. How many men would be found willing to stand day after day under loads being lifted by a chain of which they only knew that a specimen from the rods from which the links were made showed a strength equal to twice the requirements?

Add 50 per cent. to the boiler pressure, as in hydrostatic tests, with the decrease in the safety factor, and there is reasonable basis for the objections of many engineers to such tests.

The plan of sharing profits with employes has reached the newspaper business, the Boston *Herald* having adopted it some weeks ago. We have observed that several of our esteemed exchanges have earnestly and persistently advocated the profit-sharing plan, and we shall, of course, look in their columns for the announcement that they have adopted it.

Premium Sewing Machines.

The *Sewing Machine News*, under the heading of "A Crying Evil and Its Remedy," opposes the practice that newspapers have followed in selling sewing machines with subscriptions to their paper. We have always contended that the publishers of a newspaper should stick to the newspaper business, or, at least, not mix any other business with that of the publications they issue and control. We do not worry ourselves because some of our esteemed contemporaries do not agree with this view. The *News* says:

The sewing machine trade has been for several years harassed and annoyed by the competition of the newspaper premium sewing machine. The evil is not local, but widespread, and complaints reach us from all sections of the country.

The damage is not so much in the quantity of newspaper machines disposed of which reduce the sale of legitimate machines sold by members of the sewing machine trade, as it is that the general public are led to believe, by glowing advertisements of the premium offers, that the sewing machine man is a rogue who has been cheating the public by demanding and extorting twice or thrice the value of his wares.

The *News* goes further than complaining. It proposes an effective remedy. This is what it advises:

Let every sewing machine man refuse to give the slightest hint of instruction to adjust, repair or furnish supplies, not even a needle, nor in any way have anything to do with a newspaper sewing machine.

The premium machines are said to be of inferior construction, and would, therefore, need much repairing. If the above advice were followed, we believe it would end the trouble complained about.

The locomotive engineers and firemen on the Reading Railroad were recently notified that they would be required to pay fare in riding from and to their work. The men objected, and after a committee representing them had an interview with the officials of the road the notice was withdrawn. It is said that this action prevented a strike. Some years ago the Brotherhood of Locomotive Engineers had a lively contest with the Reading road.

The International Maritime Exhibition.

We recently received a call from Fred. Heysham, who presented a letter of introduction from U. S. Consul Dufair, of Havre, France. Mr. Heysham visits this country as the authorized agent of the Havre Maritime International Exhibition, which will open May 1, and close Sept. 30th, this year. This exhibition will include all articles connected with shipping, fisheries and electricity. It is under the patronage of the French Government and of the most influential merchants and public officers of the city of Havre. It is probable that quite a number of exhibitors from this country will secure space. Mr. Heysham will remain in the United States several weeks. His address will be at the Italian Consulate, New York. The facilities afforded for this exhibition are of the very best, and those having marine articles of special merit will doubtless secure much benefit by taking space for their display.

One of our Boston exchanges mentions a firm who "have erected a factory for taking all the cotton and linen from mixed fabrics, so as to leave the wool entire, so that it can be worked into new cloth." This shows that the science of deception is making progress. Formerly nothing but old woolen fabrics would furnish the proper material to be shoddied into "new cloth." The new process is not an American invention, as the machinery was specially made and imported from the old country. A new variety of "all wool" goods may now be expected to appear in the market.

The All-Powerful Coal Companies.

We take the following from an editorial in the *Mining Herald and Colliery Engineer*, which represents the anthracite coal mining companies:

The advance in the price of coal made a heavy draft on the pocketbooks of the poor of New York and left many a tenement cheerless for want of fire in midwinter. Yet those who have suffered most by it are called upon to join in the strike and force concessions from the coal companies. This is certainly a novel method of adjusting a strike, but it will prove perhaps more conclusively than it has ever been proved before, the fact that strikes are always most injurious to the strikers.

This is a warning that when the coal companies choose to raise the price of coal, pinch the poor people, and cut down the wages of their workmen it is useless to try to force any concessions from them by striking. They are held up as too powerful for that. Perhaps when those arrogant corporations go a little farther and turn the screws a little tighter on their employes and the public, a reaction will occur that will break some of their squeezing machinery.

We frequently are asked by Canadians, who call at our office or who write to us, for assistance to procure designs of American mechanical productions. They wish to copy these designs instead of originating designs of their own. We always feel disposed to treat our readers courteously whenever any of them desire information that we can furnish, but we protest against being a party to the pilfering of designs.

Literary Notes.

THE PUMP CATECHISM: A PRACTICAL HELP to Runners, Owners and Makers of Pumps of Any Kind. Covering the Theory and Practice of Designing, Constructing, Erecting, Connecting and Adjusting. By Robert Grimshaw, M. E., etc. Published by Practical Publishing Company, 7 Dey street, New York. Price, $1.

This book will undoubtedly be found of service to those having the care of pumps. We do not know of anything published covering the same ground.

PRACTICAL HANDBOOK ON PUMP CONSTRUCTION. By Philip R. Björling. E. & F. N. Spon, 35 Murray street, New York.

This book contains, in small space, much of value to both users and builders of pumps. Moreover, it is written in a plain, practical way, and is without intricate formulas. There is dearth of information on the subject of pumps, in shape for the busy man to take advantage of, and to such, having need of the knowledge, the author has furnished something which we are sure will be acceptable.

The price of the book is $1.25.

The eighteenth volume of "Ealy's Blue Book," has been issued, under date January, 1887, containing a classified list of names, with capital and credit ratings, of all manufacturers and dealers in the United States and Canada within the limits of the special branches of business to which it is intended to apply. These include hardware, iron, machinery, agricultural implements, railway, machinists', engine and boiler makers' supplies, foundries, blacksmiths, brass workers, plumbers', steam and gas fitters' supplies, stoves and kindred branches.

Calvert's Mechanics' Almanac for 1887 is, like its predecessors, filled with technical and industrial matter of value to artisans. The tables for reference are especially useful for mechanics to keep at hand. We observe in its contents a number of extracts from the AMERICAN MACHINIST. This is the only almanac we know of published especially for mechanics. It is published in Manchester, England, and sold in the United States by J. A. Gardner, 307 Floyd street, Brooklyn, N. Y. It will be mailed for 17 cents a copy.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials nor location will be published.

(66) **W. K., Cosmopolis, W. T., asks:** How can I stop a leak between steam drum and stand-pipe, the stand-pipe being cast iron, riveted to drum? *A.*—Drive some or all of the rivets new. It is a job for a boilermaker.

(67) **J. V., Pittsburgh, Pa., asks:** What is a simple way to temper small taps and solid dies? *A.*—It is a question of knowing how to temper steel. You must learn by experience. You can harden small taps and dies in water, and draw the temper in oil, but you cannot do it if you know nothing about tempering.

(68) **F. F., Henry, Ill., asks:** Please give me a cement for fastening leather belts together? *A.*—Take equal parts common glue and isinglass, put them in a glue pot with just enough water to cover them. Let them soak eight or ten hours, then apply heat till the mixture begins to boil. Add tannin till the mixture presents a ropy appearance.

(69) **H. W., Catlettsburg, Ky., asks:** Will an automatic governor work an unbalanced valve? *A.*—We suppose you to mean an unbalanced slide valve, where the governor acts direct to change the travel of valve. A governor can be made strong enough for this purpose, but the regulation will not be satisfactory. We think you will not be satisfied with trying to build such engines.

(70) **W. H., Nevada, Iowa, asks:** What is the preparation used in the form of a paste which is spread on an iron mould, so that old hard scrap iron will come out in a soft ingot? One of the ingredients is plumbago. *A.*—There is no facing for a mould that will make soft castings from hard scrap. Plumbago is one of the constituents of facing and core-wash for making smooth castings, but it will not make hard iron soft.

(71) **J. F. J., Rochester, Mich., asks:** 1. What is the power required to punch a ⅛ inch round hole in wrought-iron plate ¼ inch thick? *A.*—Haswell gives the following rule: "Multiply the product of the diameter of the punch and the thickness of the metal by 150,000; the product will give the power required in pounds." In the case cited the answer is 37,500 pounds. 2. Can I find tables of the power required to punch and shear metals in any engineers' pocket-book? *A.*—We do not recall any such tables.

(72) **L. B., New York, asks:** What should be the size of steam and exhaust ports for a 16"x30' engine, running 100 revolutions per minute, and what should be the lead? *A.*—For 500 feet piston speed the steam port may have an area of 1-12 to 1-10 that of the piston, in this case from 17 to 20 inches; the exhaust port for a slide-valve engine is usually the same length as steam port, and twice the width. The lead may be anything from 1-32 inch to ⅛ inch, whatever the engine will run stillest with.

(73) **J. P. G., Vineland, N. J., asks:** 1. Where can I find a printed description of the method followed in japanning small iron castings? *A.*—We cannot refer you to any work on the subject. The articles are thoroughly cleaned, the japan applied as a varnish, then they are placed in the oven to dry. The oven is kept at a heat which it is found by experience will not injure the japan. They may be rubbed down and revarnished any number of times. 2. What moulding material produces the smoothest iron castings? *A.*—Moulding sand, with proper facing.

(74) **E. G. S., ——, asks:** 1. I have a heater for feed water in which there is a crack 1-32 to 1-16 inch wide. How can I stop it so that the water will not come out? *A.*—Probably you can repair it by putting a patch over the crack. 2. Will you give me a simple method of setting a slide valve of an engine having two valves? *A.*—We cannot tell anything about it unless we know all about the particulars of construction. 3. I have a large lathe with much bright work on it. Sometimes the room gets very cold; then, on being warmed, the lathe sweats and rusts. What will stop it? *A.*—We do not know of anything for a lathe that is in use than to wipe it over with oily waste.

(75) **H. J. C., St. John, N. B., asks:** 1. What would be the pressure in a hydraulic cylinder 3 inches diameter, lifting 15 tons? *A.*—Dividing 30,000 pounds by the area of the 3-inch cylinder gives a pressure of 4,244 pounds per square inch. 2. Give me a rule for determining the thickness of hydraulic cylinders? *A.*—The following rule is derived from Barlow's formula: Multiply the pressure per square inch by the radius of the cylinder in inches, and divide the product by the safe cohesive strain less the pressure per square inch. Taking cohesive strain at 10,000 pounds per square inch, your 3-inch cylinder should be:

$$\frac{4244\times1\frac{1}{2}}{10000-4244}=1.1 \text{ inch thick.}$$

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Edw. Sears, Wood Engraver, 169 William st., N.Y.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

J. Clayton, Air Compressors, Rock Drills, 43 Dey st, NY

Light articles built to order by the American Sewing Machine Co., Philadelphia, Pa.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

Wanted—Tool agents in shops; outfit free. E. H. Randall & Co., 154 Lake st., Chicago, Ill.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Solid Nickel-Seated "Pop" Safety Valves. Consolidated Safety Valve Co., 111 Liberty st., N. Y.

Robbs' Patent Composition for case-hardening; send for circular. F. W. Tasney, Paterson, N. J.

Davis Key-Seating Machines, kept in stock, by Manning, Maxwell & Moore, 111 Liberty st., N. Y.

20", 25," 28" B.G. and S. F. upright drills for immediate delivery. Currier & Snyder, Worcester, Mass.

Ice and Refrigerating Machines. 120 built, and all successful, by David Boyle, 521 Monroe, Chicago, Ill.

Selden Packing, for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., NY.

The Improved Tabor Steam Engine Indicator, made and sold by The Ashcroft Mfg. Co. 111 Liberty st., N. Y.

Engine Lathes, Hand Lathes, and other fine tools, Assortment large; prices low. Frasse & Co., 92 Park row, N. Y.

Curtis Pressure Regulators, Curtis Return Trap. Curtis Damper Regulator. See Feb 5, p. 11. Send for circular No. 17. Curtis Reg. Co., Boston, Mass.

For Best Return Steam Traps, Pressure Regulators, Positive-Acting Pump Govs., Back-Pressure Valves. T. Kieley, 11 W. 13th st., N.Y. Send for des'n.

Machinists' supplies, brass goods m'f'rs supplies, polishing materials, all kinds wire, metals, etc; in any quantity. Jordan & Gottfried, 208 Canal st., N.Y.

"Morrison's Practical Engineer." A complete treatise (200 pp.) on steam and general mach. Mailed on receipt of $1. W. A. Morrison, Box 373, Lowell, Mass.

Practical Handbook on Pump Construction. Various kinds and materials to be made of for different purposes. By P. R. Bjorling. Nine plates, 12mo., $1.50. E. & F. N. Spon, publishers, 35 Murray street, New York.

"Hints to Steam Users, Engineers and Firemen." A 100-page book on care of steam boilers; just issued; containing useful rules, tables, etc.; a valuable book for engineers; sent on receipt of 25 cts. in stamps. J. N. Mills Pub. Co., 30 Vesey st., N. Y.

St. John Improved Self-adjusting Cylinder Packing, for marine and stationary engines and locomotives; applicable to water, air, oil and ammonia pumps. For durability and minimum of friction, it is unexcelled. Send for pamphlet. Address, Balance Valve and Piston Packing Co., room 58, 280 Broadway, New York.

Patent Binders for the AMERICAN MACHINIST, holding a complete volume (52 issues), simple, neat, durable. Price, $1, prepaid, to any part of the United States by mail. To Canada or foreign countries the price will be 75c.; purchasers pay express charges and customs duties. AM. MACHINIST PUB'G CO., 96 Fulton st., N. Y.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines, and current practice in testing engines and boilers. Price, $2 post-paid. Published by John Wiley & Sons, 15 Astor Place, New York.

MANUFACTURES.

It is stated that a cotton factory is to be built at Athens, Tenn.

A charcoal furnace will shortly be erected at Greensboro, Ala.

E. U. Scoville, Manlius, N. Y., will build an addition to his foundry.

Alexander J. Thompson will build a cotton factory near Mount Airy, N. C.

James McCormack, New London, Conn., will establish boiler works.

A foundry will be established in Rogers, O. John Burnbaugh is interested.

C. T. Avery, Penfield, Pa., will build a planing mill and furniture factory.

A. K. Gordon contemplates establishing a wagon factory at Birmingham, Ala.

The Fall Brook Coal Company, Corning, Pa., is building a large repair shop.

The Ross Valve Company, of Troy, N. Y., are building small water motors.

A 100-ton coke blast furnace is being erected at Bellefonte, Pa., by P. F. Collins & Co.

William Blackie, Baton Rouge, La., will establish an iron foundry at Plaquemine.

R. Stevens & Co., are erecting a furniture factory, 60x120 feet, at Winston, N. C.

A. Beringer and others are interested in a proposed cotton factory at Eufaula, Ala.

R. W. Fee is erecting a factory at Chattanooga, Tenn., to manufacture wood pulleys.

H. De Faisson, Milldale, Conn., will establish a factory for rolled silver plate metal.

A company is being formed to build a machine shop and foundry at Cleveland, Tenn.

The Rome Foundry and Machine Works, Rome Ga., are to be moved to Anniston, Ala.

Two or more companies are being organized to build iron furnaces at Tuscaloosa, Ala.

The Jung & Kauffman Brewing Company are to erect a four-story brewery in Cincinnati.

The Ashland Foundry and Machine Shops, Ashland, Ky., are to be enlarged by April 1.

The Gadsden Alabama Furnace Company, Gadsden, Ala., will build a 100-ton blast furnace.

M. F. Howell, Rome, Ga., proposes to remove his foundry and machine works to Anniston, Ala.

A company is being formed at Gadsden, Ala., to build car works. $40,000 have been subscribed.

Kate A. Ashmead will erect at 1459 Third avenue, New York, a five-story brick factory, to cost $14,000.

Land has been purchased at Johnson City, Tenn., on which, it is reported, an iron furnace is to be built.

Fitzpatrick Bros., of Chicago, are to erect a $12,000 soap factory at Western avenue and 26th street.

The Northwestern Knitting Company, of Minneapolis, Minn., will erect a factory, to cost about $20,000.

Christian Hanfeld will erect at 630 West 30th street, New York, a five-story brick factory, to cost $20,000.

W. L. Damron and N. A. Wray will erect a cotton factory at Shelby, N. C., with 2,000 spindles capacity.

The Southern Machine Company will, it is said, move their works from Shelbyville, Tenn., to Florence, Ala.

It is reported that Mr. Warner, Shelbyville, Tenn., contemplates erecting a $6,000 mill at Shepherdsville.

The Mobile and Ohio Railroad will rebuild its round-house at Cairo, Ill. It was recently destroyed by a storm.

The Florence Land, Mining and Manufacturing Company, Florence, Ala., will erect a 50-ton charcoal furnace.

H. L. Hopkins and others are interested in a new mowing machine factory about to be established in Johnstown, Pa.

Longanecker & McCullom are organizing a stock company at Chattanooga, Tenn., to manufacture fence machines.

It is reported that W. E. Turner, Dobson, N. C., contemplates establishing a foundry and machine shop at Lenoir.

The Northwestern Casket Company will put up a $40,000 factory at Eighth street and Eighth avenue, Minneapolis, Minn.

The Alabama and Tennessee Coal and Iron Company are negotiating for the erection of their three furnaces at Sheffield, Ala.

A company is being organized at Birmingham, Ala., to manufacture street cars. The capital stock will not be less than $20,000.

It is stated that the Southern Steel Works, Chattanooga, Tenn, will be moved to another location and be rebuilt on a larger scale.

George S. Burnap has leased the Phœnix Foundry and Machine Shop at Marietta, Ga., and will overhaul it and add new machinery.

The Altoona Rolling Mill, Altoona, Pa., now employs 700 hands, and the number will probably be increased to 1,000 in a month or two.

The Tallassee Falls Manufacturing Company, Montgomery, Ala., will put additional machinery in their cotton mill at Tallassee Falls.

It is reported that arrangements have been made to build a $200,000 cotton mill and a $125,000 cotton yarn mill at Decatur, Ala.

The Selma Land, Improvement and Furnace Company, Selma, Ala., will build a charcoal furnace and a charcoal and chemical plant.

Two blast furnaces and malleable iron works are reported to be built at Florence, Ala., by William Morrow and associates, of Nashville, Tenn.

George R. Lombard, Augusta, Ga., has bought the Augusta Gin Works of E. M. Birdsall & Co., and will improve them and add new machinery.

The Knights of Labor are soon to erect an extensive sash, door and blind factory at Oconto, Wis. It is to be conducted on the co-operative plan.

A $100,000 stock company has been formed by H. M. Pierce, of Nashville, Tenn., and others to build a 50-ton charcoal furnace at Decatur, Ala.

The Columbia Iron Works and Dry Dock Company, Baltimore, are enlarging their works by adding heavy machinery and tools used in building iron ships.

J. Cundell, M. G. McDonald and J. G. Dailey have formed a company at Rome, Ga., to establish a large furniture factory. The capital stock will probably be $25,000.

The Montgomery Land and Improvement Company, Montgomery, Ala., reported last week as organized, will build a charcoal iron furnace and a charcoal and chemical plant.

The Brownsport and Cedar Creek Iron Manufacturing Company, Memphis, Tenn., will build several new furnaces. Capital stock is $1,200,000. The president is Napoleon Hill.

The Nashville Iron, Steel and Charcoal Company Nashville, Tenn., Willard Warner, president, lately organized, will build two charcoal blast furnaces, a rolling mill and a steel plant.

The Altoona shops of the Pennsylvania Railroad Company have been making a freight car every working day for the past two months, so great has been the demand for equipment.

The Western Knitting Company, of Detroit, are enlarging their woolen mill at Rochester, Minn., by two Davis & Furber mules and an addition to their finishing room to twice its present capacity.

The Birmingham Iron Bridge and Forge Company, Birmingham, Ala., have secured a site for their plant, and will begin work on it at once. The building will be 90x250 feet, with two wings, each 60x75 feet.

The Gilkerson Machine Works, Homer, N. Y., publish a slip giving a list of the tools and machines made by them. It will be pasted away for reference, and consulted many times as often as a catalogue.

J. W. Rankin, Ollie Fuller, S. Inman, L. J. Hill, Aaron Haas and C. T. Swift, of Atlanta, Ga., and others, have bought the Bartow Iron Works property near Cartersville. They will organize a stock company to develop it.

T. C. Thompson has the contract to erect the new buildings for the machine shops and foundry of Aiken & Lighton, Birmingham, Ala., previously reported. The foundry will be 50x130 feet, and the other building 40x200 feet.

The Western Co-operative Brass Manufacturing Co., of Cincinnati, has been incorporated. Capital stock, $5,000. Geo. H. Walker, Frank Reeve, Jos. F. Stout, Jas. P. Lenahan, 175 W. Third street, and Richard R. Daly, corporators.

A $200,000 stock company has been organized at Anniston, Ala., to build pipe works with a daily capacity of 300 tons. J. M. McKelroy, President Anniston City Land Company, can give information.—*Baltimore Manufacturers' Record.*

The Bellefonte Iron Company are erecting a coke blast furnace at Bellefonte, Pa., which will have a daily capacity of about 100 tons. The height will be 70 feet and diameter of bosh 15 feet, and the hot air will be generated by three Whitwell stoves.

E. Scott and associates, of Chattanooga, Tenn., have had a site on Chattanooga Creek, in that city, donated to them, and as soon as they can get railroad connection they propose to build a foundry and steam forge, and to manufacture nuts and bolts.

A stove factory, a plow factory, a 100-ton blast furnace, a furniture factory, a shovel and hoe factory, and several other new enterprises are promised at Nashville, Tenn. The Nashville Land Improvement Company are helping the industrial extensions.

At Fitchburg, Mass., the Simonds-Rolling-Machine Company, of Boston, is erecting a new factory. The experimental works are to be 160x60 feet—part one story in height and part two stories, with boiler rooms, etc. In addition to the above, the company will occupy an adjoining building, 80x30 feet, and three stories in height.

The Florence Coal, Coke and Iron Company—capital stock, $1,000,000—has been organized at Florence, Ala., with John Woodard, M. A. Spurr, of Nashville, Tenn., W. B. Burnett, of Cincinnati, O. and others, as directors. The company own the property of the McNab Coal and Coke Company, and will increase the output of the McNab mines. Will build a 100-ton furnace.

The Geneva *Gazette*, of Geneva, N. Y., says "Mr. W. B. Dunning has received within the pas few months orders and inquiries for his patent steam heating boilers from England, Germany, France, Russia, Ireland, Japan, China and Spain. This puts it before nearly all the civilized world, and establishes its precedence over all others as to merits."

The Iowa Iron and Brass Works, Des Moines, Iowa, have been in operation one year, and write us that they are enjoying "prosperity and good fortune." They have added some new machinery and more men. They manufacture an automatic air valve for steam pipes and radiators, which meets popular approval. They also make coffee roasters, and do special work in iron or brass upon orders.

The Jos. Dixon Crucible Company, Jersey City, N. J., send free a 44-page catalogue, which is interesting as showing the uses to which graphite is put Mr. Dixon was the originator of black lead crucibles. The company make graphite paint, graphite grease for all purposes, graphite core wash and facing—in fact, preparations in which graphite enters largely for a variety of purposes too numerous to mention. They also make graphite pencils and a machine for sharpening pencils.

The Crompton Loom Works, Worcester, Mass., of which the late George Crompton was proprietor, are running full time the same as before Mr. Crompton's death. The business was so well systematized, having a man at the head of each department who was fully competent to manage it, that developing and improving the loom will go on as before, as in the building of fancy looms, new attachments are constantly being invented to anticipate or meet the wants of progressive manufacturers. The business management will be under the supervision of Mr. Wyman and Mr. Ware, the same as before.—*Boston Journal of Commerce.*

Machinists' Supplies and Iron.

NEW YORK, Feb. 10, 1887.

American Pig—Best brands No. 1 X Foundry have sold at $22 to $22.50; No. 2 X, $20 to $20.50; Grey Forge, $18.50 to $19.

Scotch Pig—Transactions are small, but prices are held fairly firm, at Coltness, $23.50 to $24; Gartsherrie, $22 to $22.50; Eglinton, $21 to $21.50; Langloan, $22 to $22.50; Dalmellington, $21.50.

Copper—Lake is held at 11c.; other brands, 10c. to 10¼c.

✲WANTED✲

"Situation and Help" Advertisements only inserted under this head. Rate, 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

A machinist of large experience in general shop practice is open to an engagement. F. J. Masten, Belmont, N. Y.

Wanted — Mechanical draftsman. Address "Conly," office of AM. MACHINIST, stating amount and kind of experience had and compensation required.

Wanted—By an experienced patternmaker, situation as foreman patternmaker; good reference. Address S. K., AM. MACHINIST.

Foundry foreman, 20 years' experience, desires a position; highest references; heavy machinery preferred. Address Skillful, AM. MACHINIST.

Wanted—Situation as foreman of iron foundry; accustomed to heavy work; 15 years' experience as foreman; work by the ton preferred. Address A. R., AM. MACHINIST.

Patternmaker wanted; one accustomed to gas and steam fittings and valve work preferred; must be a first-class workman. Address Box 1358, New York City.

Wanted—An energetic foreman with a thorough knowledge of the manufacture of shafting and general mill work. Address R. W. C., P. O. Box 2466, N. Y. city.

Wanted—Two or three toolmakers and six good all-around men, to work in machine shop near Albany, N. Y. Address R. W. C., P. O. Box 2466, N. Y. city.

A first-class mech. engineer and draftsman, practical and theoretical, with great experience, wants position; can take charge of drawing room. Address "M. E. & D.," AM. MACHINIST.

Wanted—Position as foundry foreman, by a first-class foundryman; had 20 years' experience as foreman on all kinds of heavy machinery castings. Address Experience, AM. MACHINIST.

Wanted—A situation by a first-class man as foundry foreman—one who understands the business in all its branches; 26 years' experience gas foreman. "Cupola," AM. MACHINIST.

A first-class mechanical draftsman, good designer on steam engines and special machinery (heavy work), desires to change his present position. Address Box 10, AM. MACHINIST.

Wanted—By a first-class foundryman, position as foreman where ability will count; able and willing to solicit contract work; agricultural shop preferred; best of references from present employer. Address M. L. A., AM. MACHINIST.

✢ MISCELLANEOUS WANTS. ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Crescent Boiler Tube Expander; second to none, price in reach of all. Crescent Mfg. Co., Cleveland, O.

The Crescent Link Belt Coupling; something new; sample free. Crescent Mfg. Co., Cleveland, O.

Light mach'y of all kinds built at short notice Edmund Mills, 8 Dey st., Jersey City Heights, N. J.

For Sale—One 1⅛" Merriman bolt-cutter, one 20' swing, 12 ft. bed, engine lathe, both new. The McLagon Foundry Co., New Haven, Ct.

Special tools and machines for mfg. designed and built to order; mechanical and Patent Office drawings. Weston & Smith, Syracuse, N. Y.

For Sale, Cheap—One new horizontal steam engine, 1½ horse-power; cylinder, 2⅛" dia. × 5" stroke; all complete. A. H. Jackson, Modena, Pa.

Castings for machine shops, water wheels, engines, pulp mills, saw mills and miscellaneous work Malone Foundry and Machine Co., Malone, New York.

To Manufacturers of Steam Engines—I will furnish an automatic steam-engine governor, extremely simple in construction and absolutely perfect in other respects. Address Inventor, AM. MACHINIST.

Wanted—A competent manager to take charge of and an interest of $10,000 in large and well-established foundry and machine works, conveniently located near the city of Troy. The works are well equipped and arranged for all kinds of work, particularly for heavy work; running steadily; work to be had to a full capacity, by a practical and energetic manager. All communications strictly confidential. Address J. H. Winslow & Co., Troy, New York.

✢ MISCELLANEOUS WANTS. ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

For Sale—Valuable Manufacturing Property, centrally located in one of the largest Western States, with a well-established reputation for the goods of its manufacture, which consist of engines, boilers, saw and grist mill machinery, and kindred articles. Property all in first-class condition; tools and machinery in good order, and the works now running. Parties who mean business, and desire to engage in a profitable and well-established business of this character, can get full particulars by writing or applying in person to M. D. Wheeler, Stapleton, Staten Island, N. Y., or Manning, Maxwell & Moore, 111 and 113 Liberty st., New York.

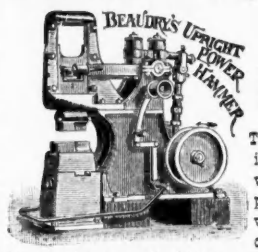
BRADLEY'S UPRIGHT CUSHIONED HELVE HAMMER

Established 1832.

Combines all the best elements essential in a first-class Hammer. Has more good points, does more and better work and costs less for repairs than any other **Hammer** in the **World.**

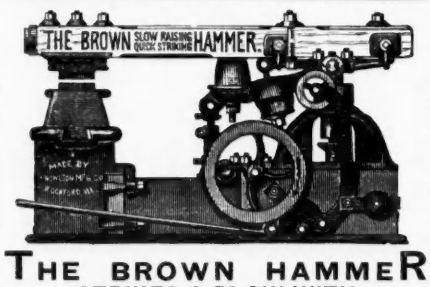
BRADLEY & CO. Syracuse, N.Y.

BEAUDRY'S ✢ UPRIGHT CUSHIONED POWER HAMMER



The success of our machine is the best guarantee of its value. Only hammer with patent Duplex Steel Helve which never rattles, burns or breaks. Guaranteed to do more and better work with less repairs than any other.

BEAUDRY & CUNNINGHAM, Boston, Mass.



THE BROWN HAMMER

STRIKES A BLOW WITH

Double the Velocity That it Raises the Hammer.

A NEW MOVEMENT! SEND FOR DESCRIPTION.

KNOWLTON MFG. CO., KING ST., ROCKFORD, ILL.

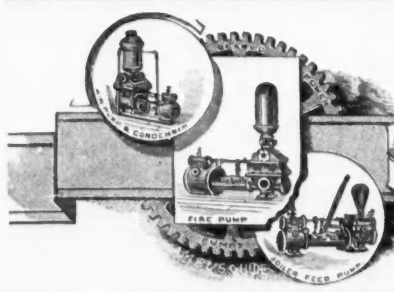
STEPHENS PATENT VISES.

ONE-HALF TIME and LABOR saved by using this solid, strong, durable, firm-hold, quick-working Lever (Not Screw) Vise. Has improved Taper-Pipe and other attachments. Sold by the trade. Send for circular

TOWER & LYON, 95 Chambers Street, New York.

Successors to MELVIN STEPHENS.

KNOWLES Steam Pump Works.



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IMPROVED PUMPING MACHINERY | For Every Class of Work | SEND FOR NEW ILLUSTRATED CATALOGUE.

THE HERCULES. TRADE MARK PAT'D JUNE 12 1883

Section of **Copper-Wire-Sewed Light Double Belting,** specially adapted to use on cone pulleys and other hard places. Manufactured by the **PACE BELTING CO., Concord, N. H.** Also manufacturers of Staple and Special Grades of Leather Belting and the "Hercules" Lacing. Send for Catalogue No. 2.

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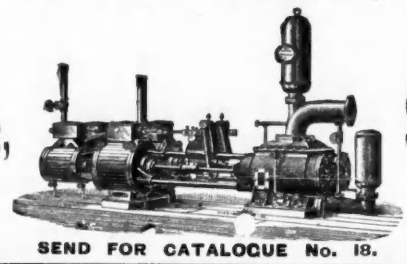

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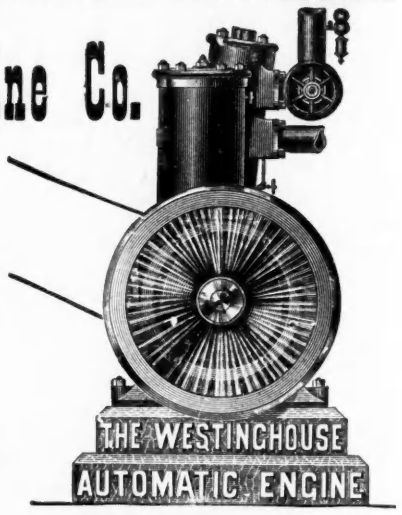

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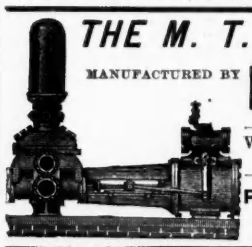

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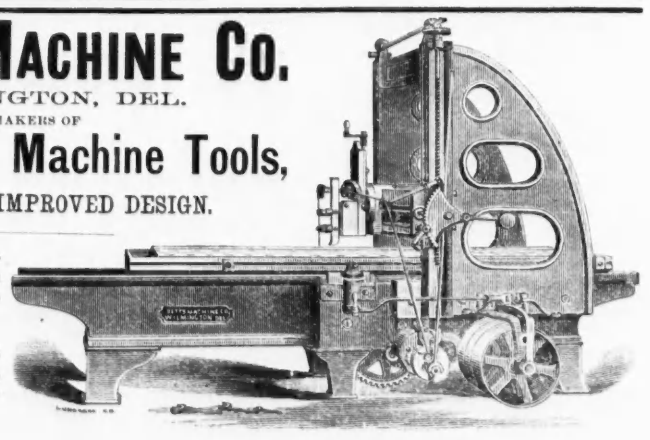

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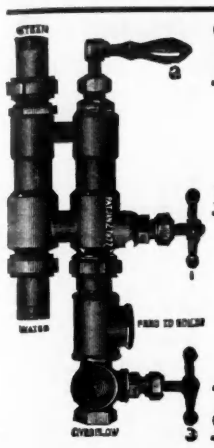

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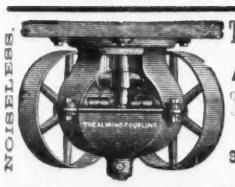

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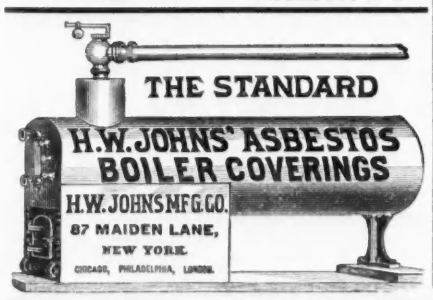

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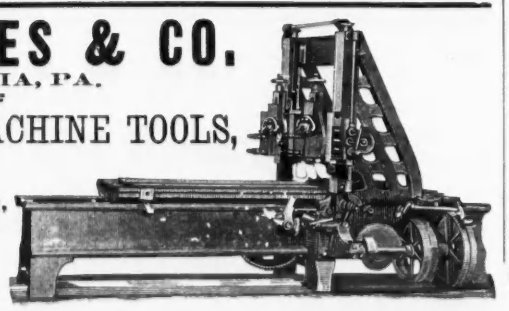

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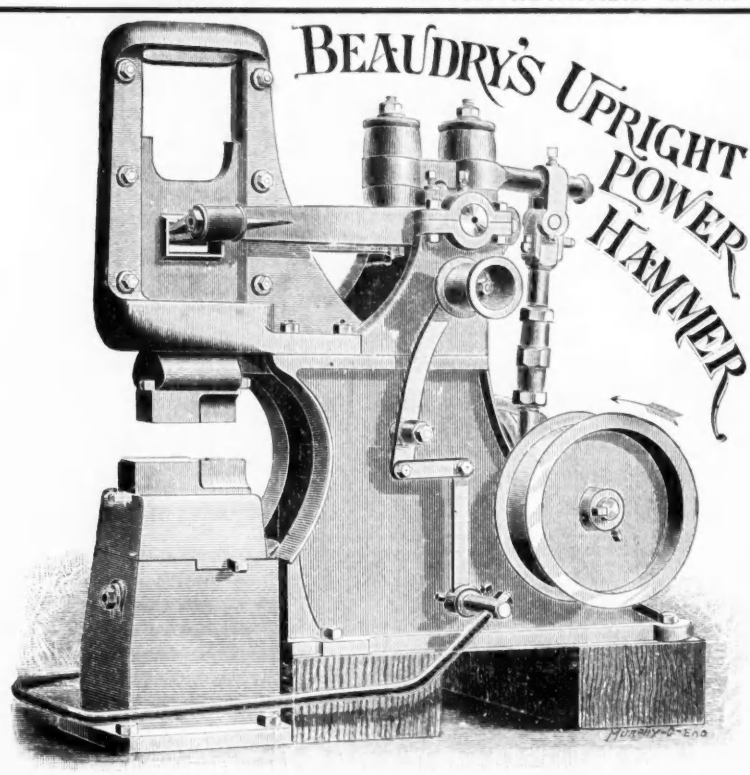

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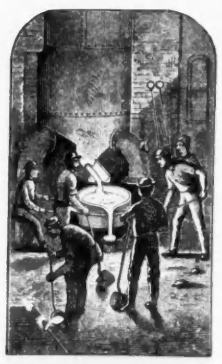

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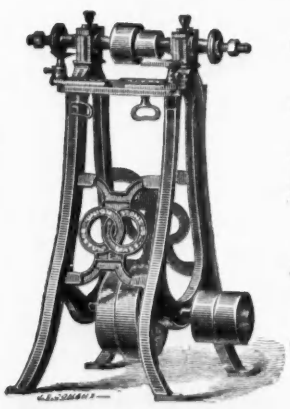

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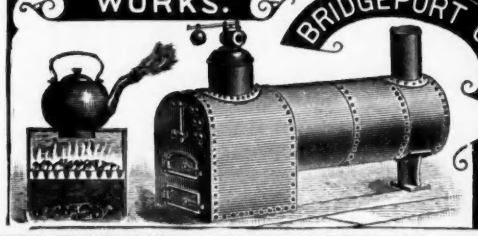

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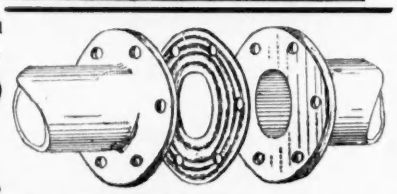

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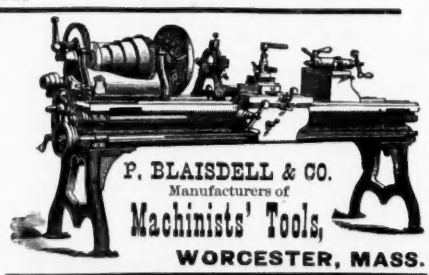

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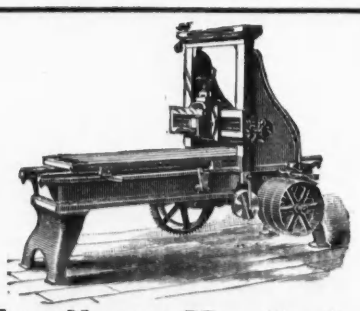

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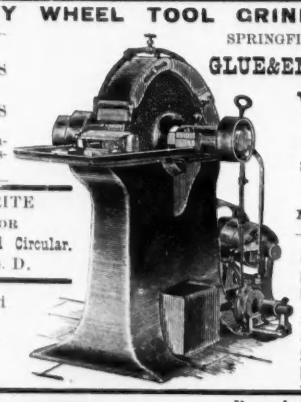

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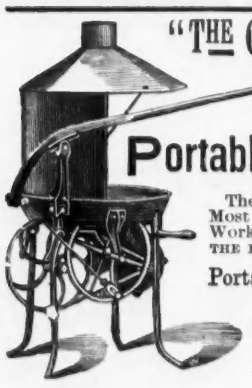

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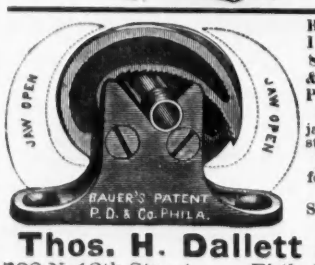

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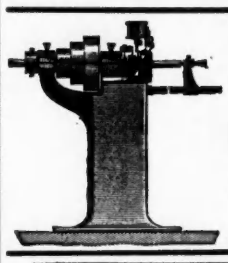

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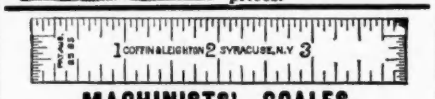

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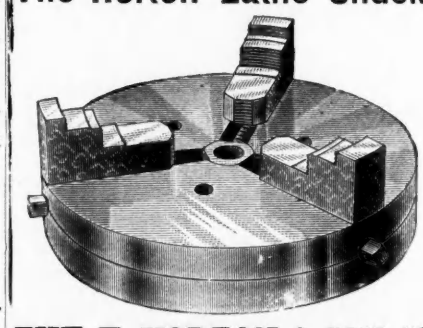

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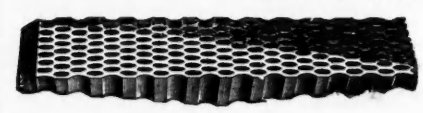

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Will not burn off at the ends.
Will give absolutely 70% air space.
Will give uniform combustion of fuel.
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"OUR BEST."
Powerful and Noiseless,
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36 Inch,	to plane any length up to		20	Ft.
40 Inch,	"	"	20	"
42 Inch,	"	"	26	"
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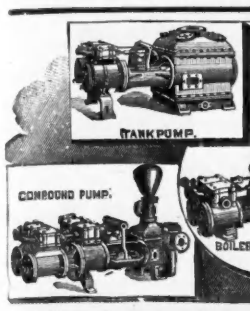

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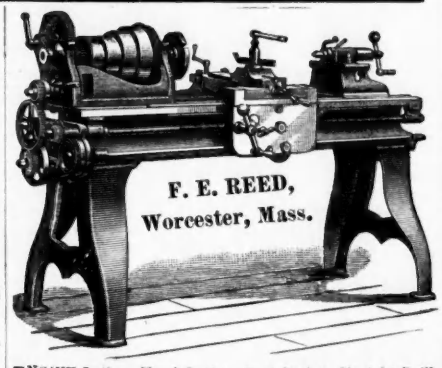

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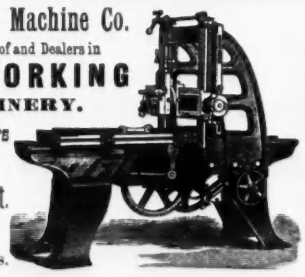

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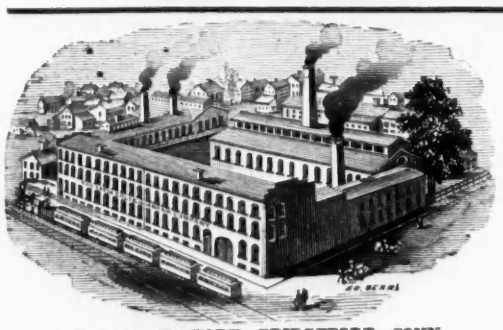

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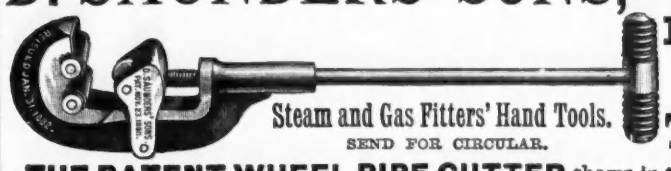

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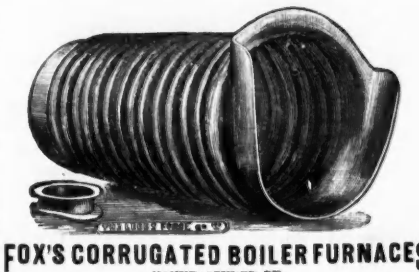

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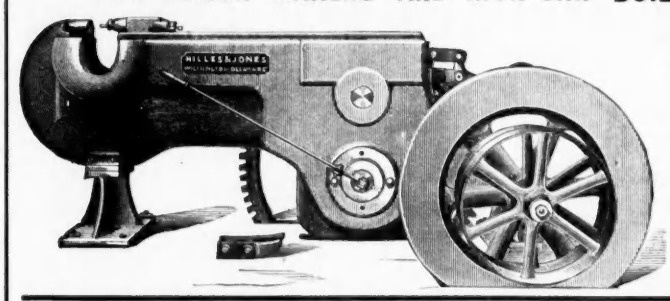
FOR BOILER MAKERS' AND IRON SHIP BUILDERS' USE.



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Depth of Jaws from 6" to 42".

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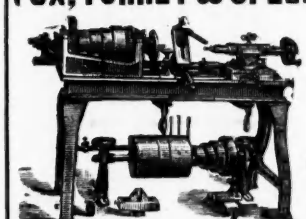

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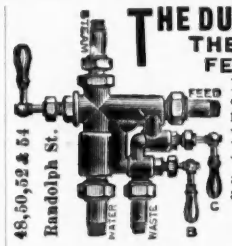

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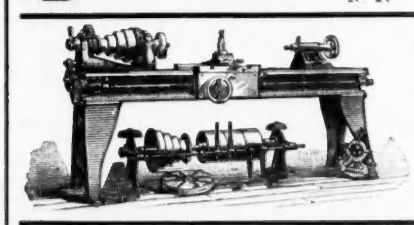

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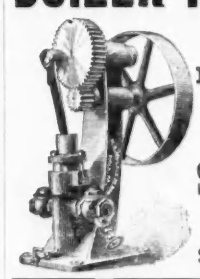

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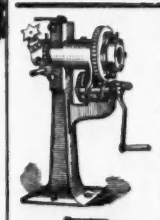

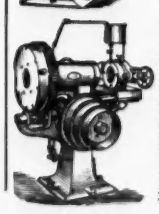

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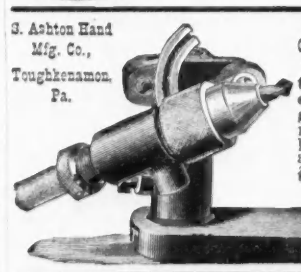

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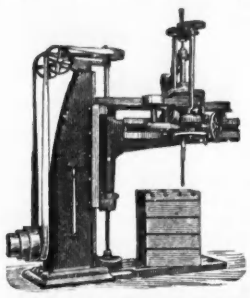

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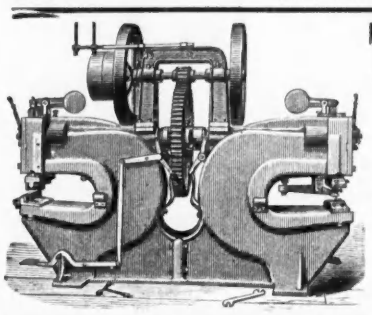

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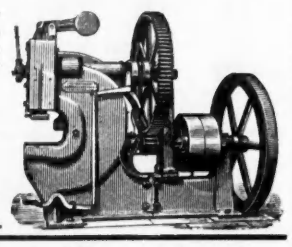

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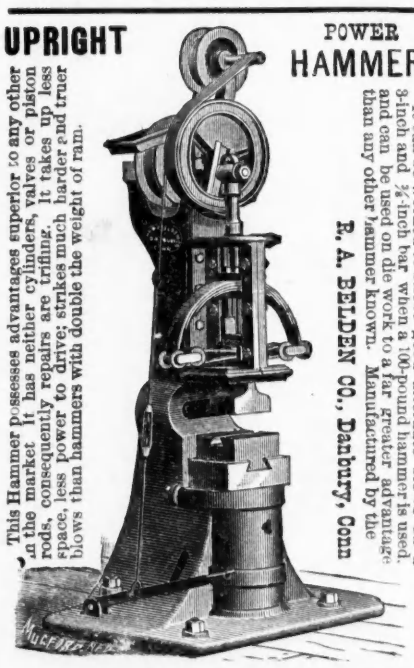

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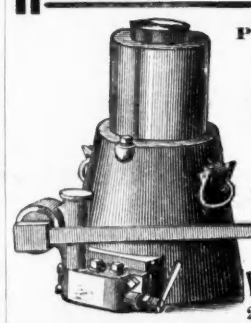

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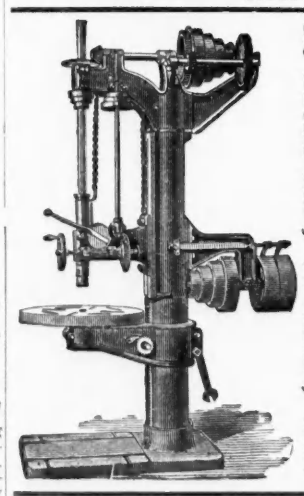

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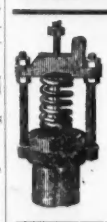

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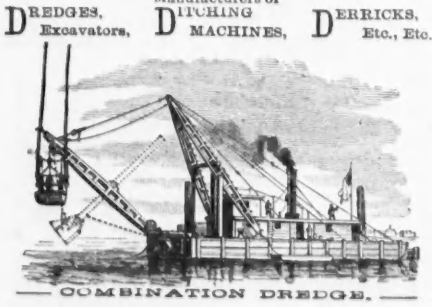

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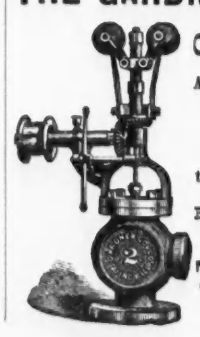

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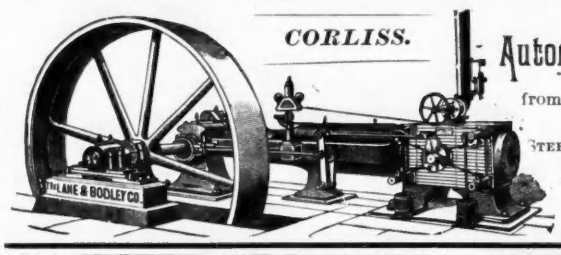

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SMOOTH INSIDE & OUT.

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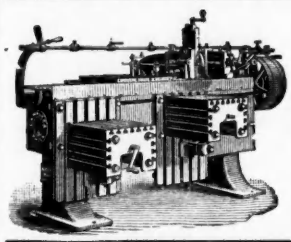

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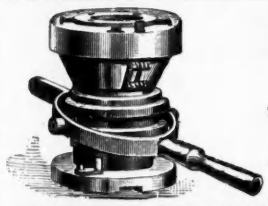

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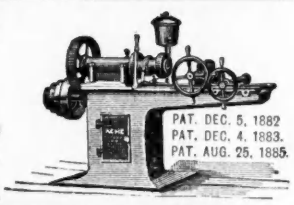

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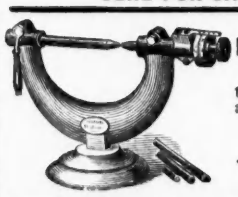

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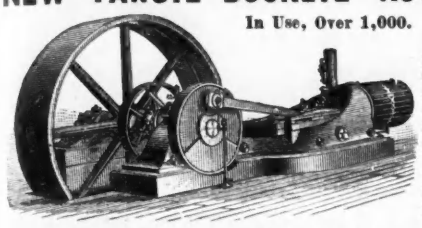

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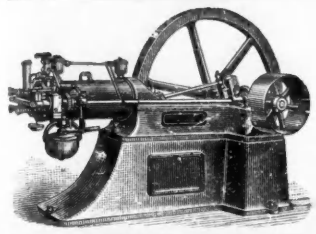

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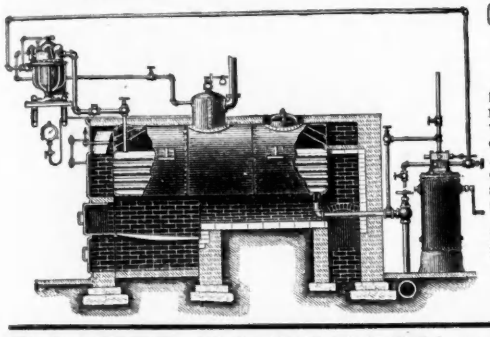

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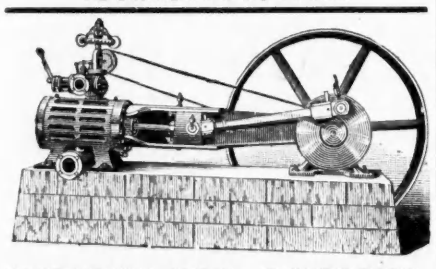

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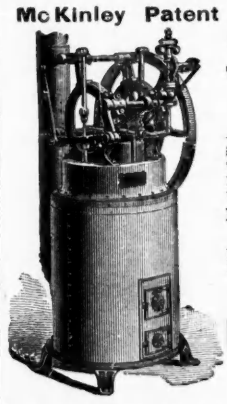

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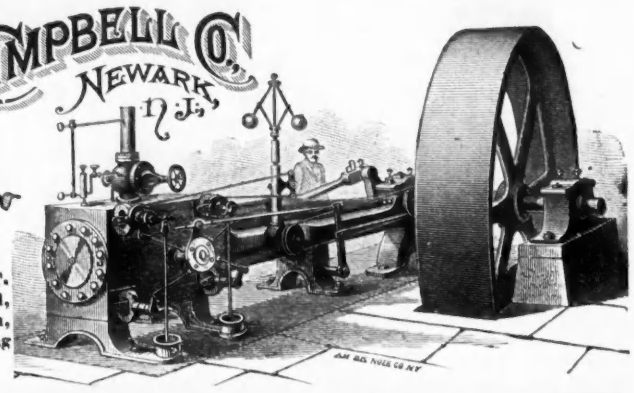

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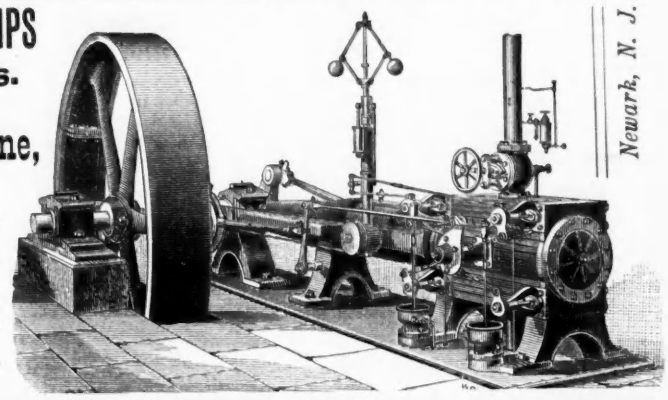

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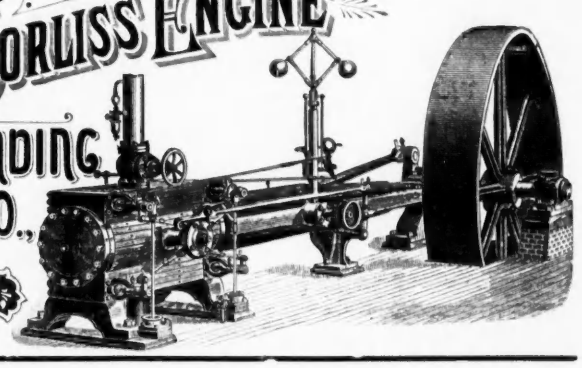

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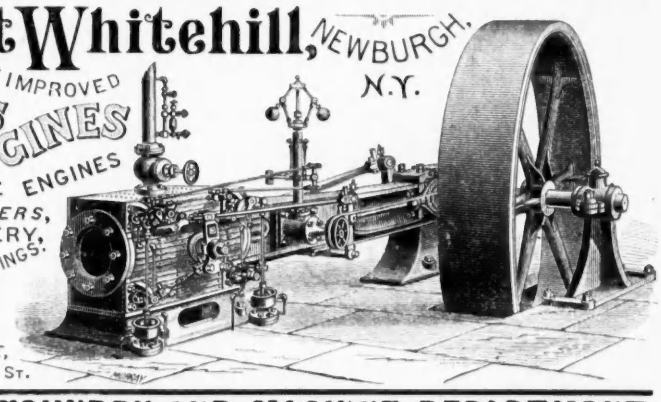

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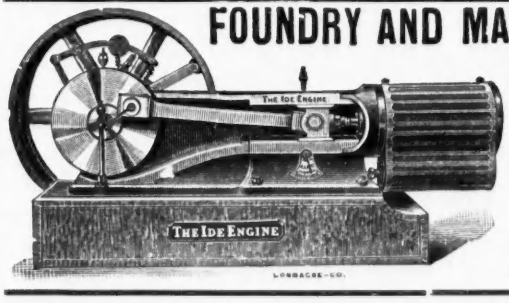

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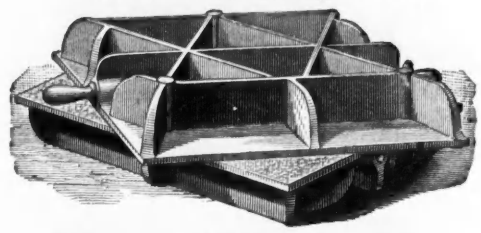

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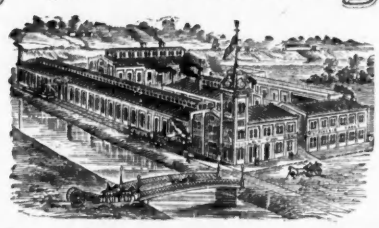

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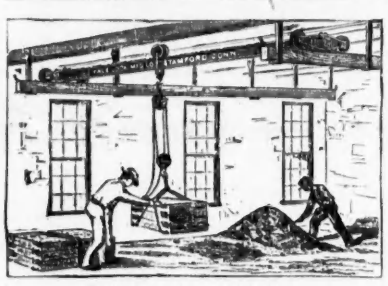

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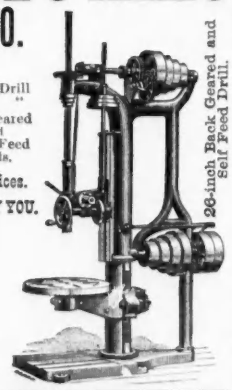

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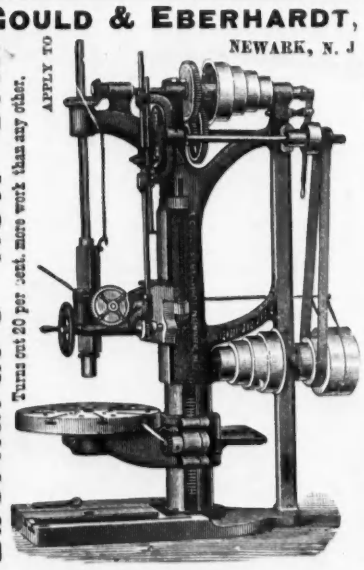

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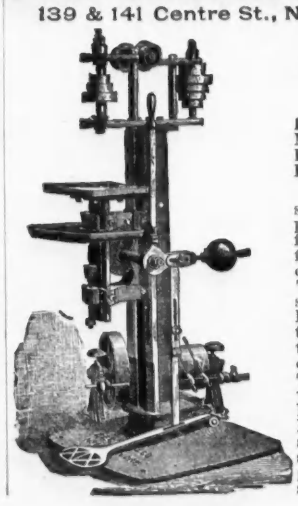

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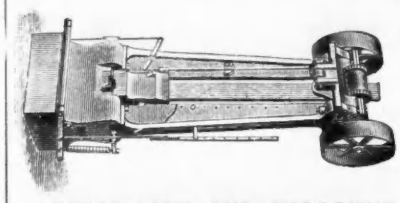

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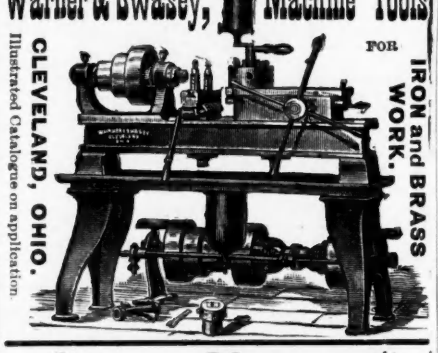

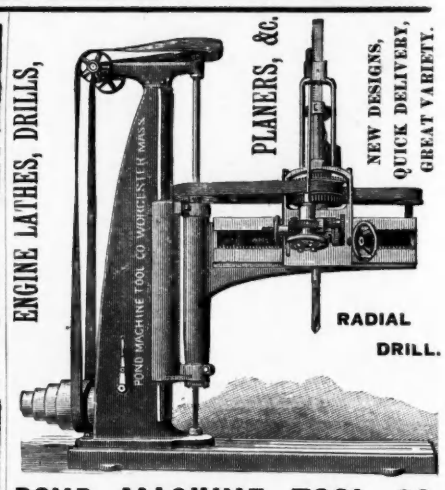

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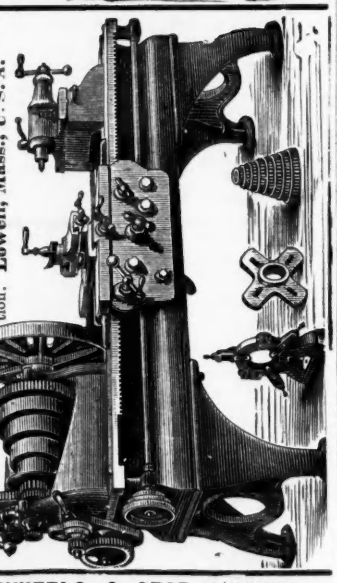

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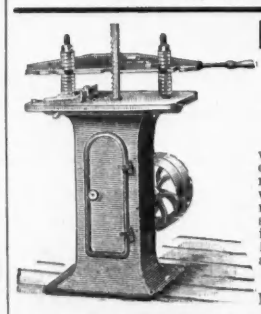

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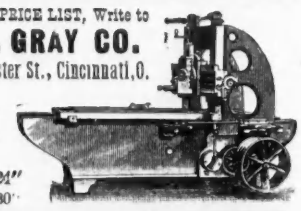

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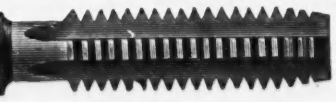

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